



**United States Air Force  
11th Air Control Wing  
11th Civil Engineering  
Operations Squadron**  
**Elmendorf AFB, Alaska**

FINAL

Indian Mountain LRRS,  
Alaska

REMEDIAL INVESTIGATION/  
FEASIBILITY STUDY  
HEALTH & SAFETY PLAN

JULY 1994

By:

DTIC QUALITY INSPECTED 1



JACOBS ENGINEERING GROUP INC.  
600 17th Street, Suite 1100N  
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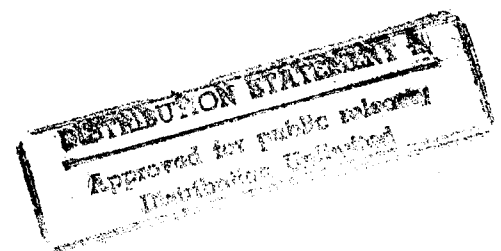
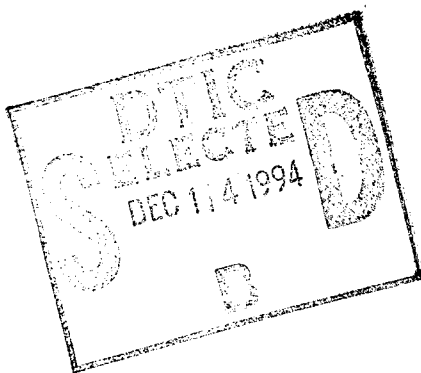


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# JACOBS ENGINEERING GROUP INC.

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06 December 1994

Mr. Samer Karmi  
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AFCEE/ERDW  
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**Subject: Contract No. F41624-94-D-8046  
Delivery Order No. 4  
Remedial Investigation/Feasibility Study  
Indian Mountain Long Range Radar Station, Alaska  
Submittal of Planning Documents**

Dear Mr. Karmi:

In accordance with the Statement of Work for Delivery Order No. 4, we are submitting two copies of the final Work Plan (WP), Sampling and Analysis Plan (SAP), and the Health and Safety Plan (HSP) for the Remedial Investigation/Feasibility Study at Indian Mountain LRRS, Alaska.

We have forwarded copies of these plans to Patricia Striebich, and a copy each to the Defense Technical Information Center (DTIC) and the National Technical Information Service (NTIS).

If there are any questions or if you require additional copies of the report, please contact me at (303) 595-8855.

Yours truly,  
JACOBS ENGINEERING GROUP INC.

Robert S. Henry  
Project Manager

cc: Chris Williams, Jacobs  
Sarah Brown, Jacobs  
Document Control

## PREFACE

This Health and Safety Plan (HSP) describes the requirements for the expected tasks and activities needed to complete the remedial investigation activities at Indian Mountain Long Range Radar Station, according to the requirements of Contract No. F41624-94-D-8046, Delivery Order 4, between the U.S. Air Force and Jacobs Engineering Group Inc. It was developed to make certain that all environmental data generated for the project are scientifically valid, defensible, comparable, and of known and acceptable precision and accuracy. This HSP has been prepared in accordance with format and content requirements, as applicable, of the *Handbook for the Installation Restoration Program Remedial Investigations and Feasibility Studies* prepared by the Air Force Center for Environmental Excellence, Brooks AFB, dated September 1993.

The Jacobs Engineering Group Inc. Project Manager for this contract is Ms. Lynn Schuetter. The Contracting Officer Representative for the AFCEE is Mr. Mike McGhee.

Approved:

*for* Walter K. Reiser  
Robert Siek  
Program Manager

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## NOTICE

This HSP has been prepared for the U. S. Air Force by Jacobs Engineering Group Inc. for the purpose of aiding in the implementation of a final remedial action plan under the U.S. Air Force Installation Restoration Program (IRP). Because this HSP relates to actual or possible releases of potentially hazardous substances, release of the HSP before a U.S. Air Force final decision on remedial action may be in the public's interest. The limited objectives of this HSP and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this HSP, since subsequent facts may become known that may make the HSP premature or inaccurate. Acceptance of this HSP in performance of the contract under which it is prepared does not mean that the U.S. Air Force adopts the conclusions, recommendations, or other views expressed herein. Such conclusions, recommendations, or other views expressed are those of the contractor only and do not necessarily reflect the official position of the U.S. Air Force.

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## LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AC&W	Aircraft Control and Warning
ADF&G	Alaska Department of Fish and Game
AFB	Air Force Base
ATV	All Terrain Vehicle
CEOS	Civil Engineering Operations Squadron
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CPR	Cardiopulmonary Resuscitation
dBA	Decibels on the A-weighted Scale
DRI	Direct Reading Instrument
DRMO	Defense Reutilization Management Office
EPA	Environmental Protection Agency
eV	Electron Volt
FID	Flame Ionization Detector
FS	Feasibility Study
HEPA	High-Efficiency Particulate Air
HSP	Health and Safety Plan
IDLH	Immediately Dangerous to Life and Health
IRP	Installation Restoration Program
Jacobs	Jacobs Engineering Group Inc.
LEL	Lower Explosive Limits
LRRS	Long Range Radar Station
MAR	Minimally Attended Radar
MEK	Methyl Ethyl Ketone
mg/m <sup>3</sup>	Milligrams per Cubic Meter
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
O <sub>2</sub>	Oxygen
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyl
PCH	Polycyclic Hydrocarbon
PEL	Permissible Exposure Limit
PHSM	Program Health and Safety Manager

## LIST OF ACRONYMS

PID	Photoionization Detector
PNA	Polynuclear Aromatic
POL	Petroleum, Oils, and Lubricants
PPE	Personal Protective Equipment
ppm	Parts per Million
PVC	Polyvinyl Chloride
RI	Remedial Investigation
REL	Recommended Exposure Limit
SHSC	Site Health and Safety Coordinator
SI	Site Investigation
SOP	Standard Operating Procedure
TCE	Trichloroethylene
TLV	Threshold Limit Value
TWA	Time Weighted Average
UST	Underground Storage Tank
WACS	White Alice Communications System
°F	Degrees Fahrenheit
%	Percent

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Appendix L	Employee Exposure/Injury Report
Appendix M	Accident Investigation and Notification Form

## **1.0 INTRODUCTION**

This Health and Safety Plan (HSP) provides site-specific health and safety controls to be followed during Remedial Investigation (RI)/Feasibility Study (FS) field activities to be conducted at Indian Mountain Long Range Radar Station (LRRS).

This HSP has been written for the exclusive use of Jacobs Engineering Group Inc. (Jacobs), its employees, and subcontractors. Jacobs claims no responsibility for its use by others. The plan is written for the specified site conditions, dates, and personnel and must be amended if these conditions change. A plan approval sign-off sheet documenting acceptance by the Project Manager and Corporate Health and Safety Manager is provided as Appendix A.

The elements of the plan include procedures for personal protection, personnel and equipment safety, medical surveillance, air quality monitoring, and general work practices. This plan also details proper emergency procedures including emergency response and first aid capabilities. Compliance with this HSP is required by all Jacobs employees and subcontractors entering the Indian Mountain LRRS site.

### **1.1 HISTORICAL OVERVIEW OF SITE**

The following sections describe the site, its history, and waste management practices.

#### **1.1.1 Site Description**

Indian Mountain LRRS is located 410 miles north of Anchorage and 195 miles northwest of Fairbanks, Alaska (U.S. Air Force 1985). The remote site is accessible only by air. The site consists of approximately 4,226 acres of land with a 4,300-foot landing strip (U.S. Air Force 1991). The nearest community to the installation, Hughes, is 15 miles east of Indian Mountain. There is no road connecting Hughes with the installation (U.S. Air Force 1993). Figure 1-1 depicts the location of Indian Mountain LRRS.

The installation is comprised of two camps: Upper Camp and Lower Camp. The two camps are connected by a steep and winding 8-mile road. The Upper Camp which is located on top of Indian Mountain, previously provided working and living facilities for station personnel. The only remaining structures at Upper Camp include the Minimally Attended Radar (MAR) unit and a small shed for storage of the backup generator. The Lower Camp, located south of Upper Camp, is on the confluence of Indian River and Utopia Creek. The Lower Camp formerly consisted of a runway, power plant, bulk fuel storage, and other housing facilities. Additional buildings including an industrial/residential facility, two storage buildings, a pumphouse, and several underground storage tanks (UST) were constructed in 1984. The old camp buildings (Upper and Lower), including the White Alice Communications System (WACS) facility, were demolished in 1986 (U.S. Air Force 1993). Figures 1-2 and 1-3 depict the Lower and Upper Camps of the Indian Mountain LRRS site.

#### **1.1.2 Site History**

The first facility at Indian Mountain was an Aircraft Control and Warning (AC&W) facility that was constructed in the early 1950s. The facility was installed to cover radar gaps in the interior of Alaska. A high frequency radio system supplied the

initial communications. This system proved unreliable due to atmospheric disturbances and was replaced in 1958 by a WACS. The WACS system eventually became obsolete and was replaced in 1979 by an Alascom-owned satellite earth terminal. In 1984, a MAR was installed, which remains active.

### **1.1.3 Indian Mountain LRRS Waste Management Practices**

Liquid wastes have been generated at Indian Mountain LRRS by industrial operations such as power generation and vehicle maintenance. Lubricating oils and small amounts of solvents are the principal hazardous wastes produced. Past practices include spreading petroleum-based wastes on installation roads for dust control. This practice continued until 1984. Wastes are presently collected in drums and staged at the accumulation area adjacent to the eastern end of the runway, where the drums are stored before being transported by air to the Elmendorf Air Force Base (AFB) Defense Reutilization Management Office (DRMO).

All fuel supplies for the installation are airlifted to the site. Liquid fuels are pumped directly from the supplying aircraft to the Petroleum, Oils, and Lubricants (POL) storage tanks adjacent to the runway. According to the station personnel, the tanks have never been cleaned. Tank trucks are used to transport fuel to the Upper Camp. Fuel leaks are monitored by inventory control, which has shown a considerable spill and leak problem (U.S. Air Force 1993).

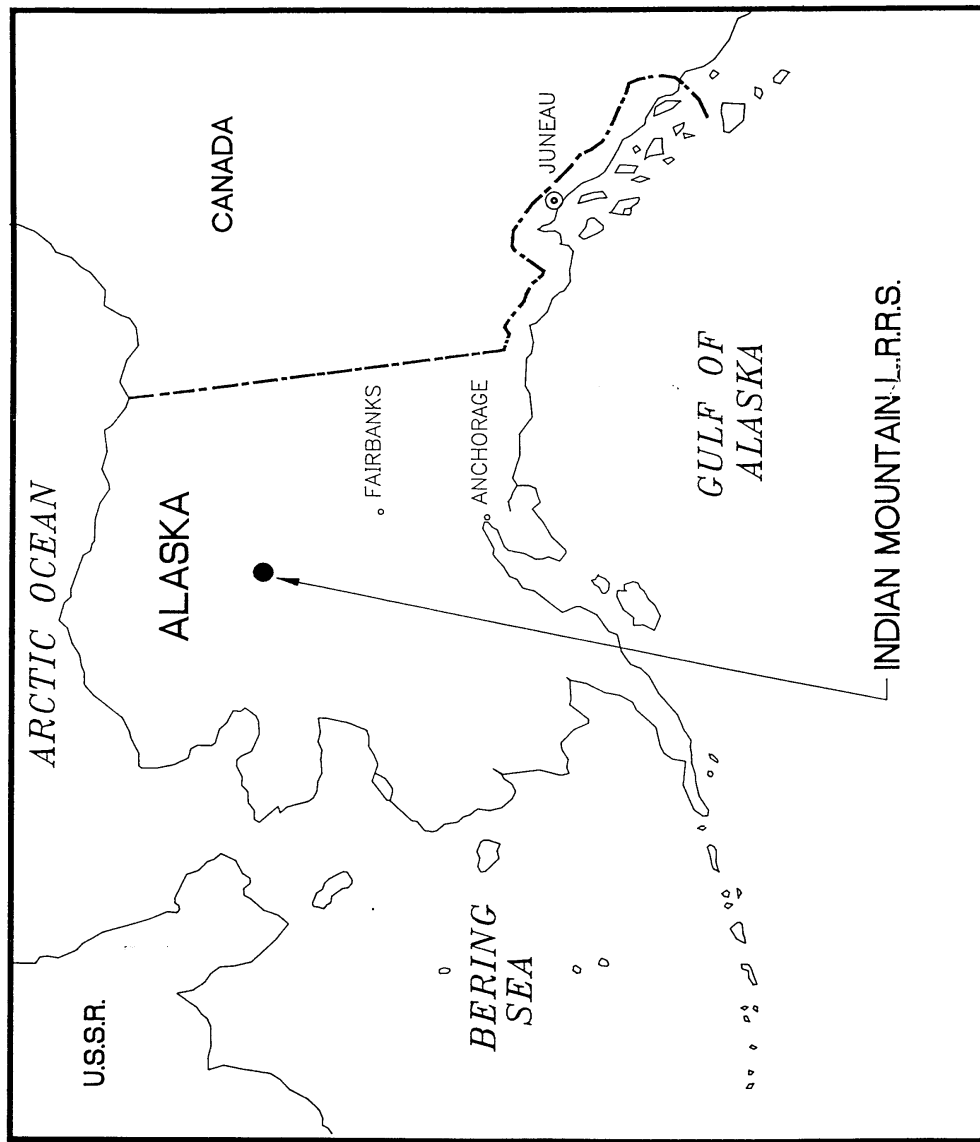
Based on current information of the past and present waste disposal practices, three contaminant source types have been identified. They are (1) spills and releases, (2) land disposal operations, and (3) general past and ongoing materials storage activities. Tables 1-1, 1-2, 1-3, and 1-4 present inorganic and organic contaminant concentrations detected.

## **1.2 HEALTH AND SAFETY ORGANIZATION**

The following sections briefly describe the health and safety organization, personnel, and general responsibilities that will be assigned during RI/FS activities at Indian Mountain LRRS.

### **1.2.1 Program Health and Safety Manager**

The Program Health and Safety Manager (PHSM) has the primary responsibility for ensuring that the policies and procedures of this HSP are implemented. The PHSM ensures that all required personnel designated to work at Indian Mountain LRRS sites are qualified to do so by participating in a medical surveillance program and completing health and safety training consistent with Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120 regulations covering Hazardous Waste Operations and Emergency Response. The PHSM is responsible for providing the appropriate monitoring and safety equipment necessary for the implementation of this HSP. Any significant changes to the HSP must be approved by the PHSM. Dr. Terry Briggs in Jacobs' Denver office is the PHSM.



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 ANNUAL RATE OF CHANGE : 4.1"  
 U.S.S.R. DATA 1985

LEGEND  
 CAPITAL

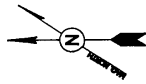
INDIAN MOUNTAIN  
 LONG RANGE RADAR STATION  
 LOCATION MAP



LOCATION MAP

PROJ. HGR.	ACAD. FILE NO.	DATE	FIGURE NO.
L. SCHUETTER	FIG. 1-1	4/7/94	1-1
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MAGNETIC DECLINATION: 24° 42'  
ASTRAL RATE OF PRECESSION: 4.1"  
USDA, 1990

### LEGEND

- BUILDINGS
- GRAVEL ROADS
- RIVER, STREAM, DR CREEK
- INDEX CONTOUR
- ESCARPMENT
- CULVERT
- TRAIL
- APPROXIMATE WASTE ACCUMULATION LOCATION AREA
- APPROXIMATE LANDFILL LOCATION AREA
- APPROXIMATE AREA OF CONCERN LOCATION

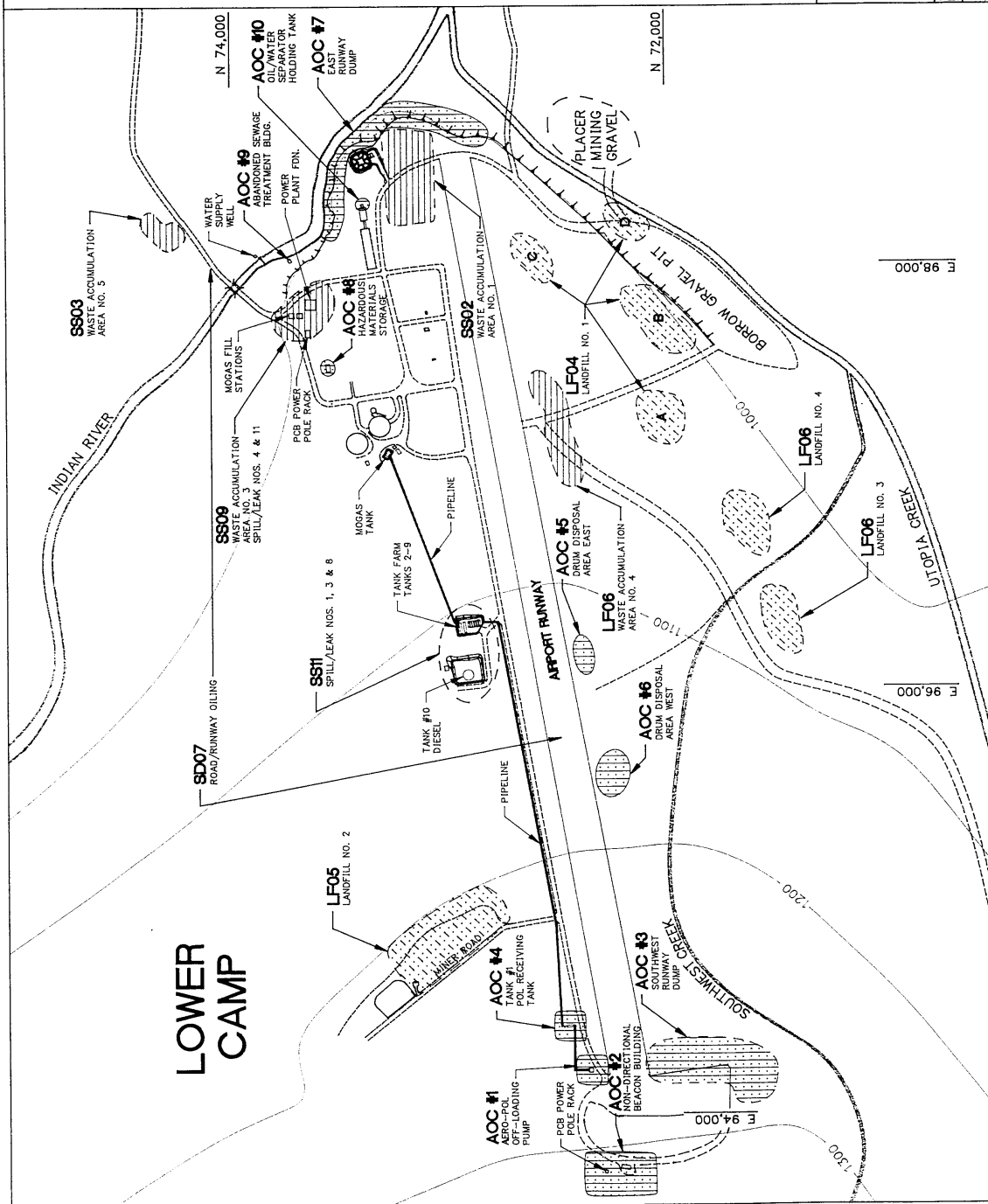
NOTE:  
SAMPLE LOCATIONS ARE FOR  
ILLUSTRATIVE PURPOSES ONLY



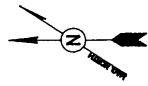
INDIAN MOUNTAIN  
LONG RANGE RADAR STATION  
SOURCE MAP  
LOWER CAMP



PROJ. NO.	ACAD. FILE NO.	FIGURE NO.
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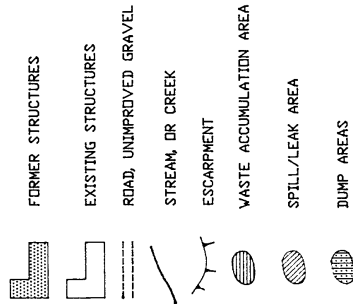


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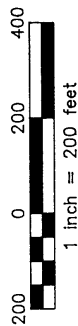


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U.S.G.S. EPOCH 1985

### LEGEND



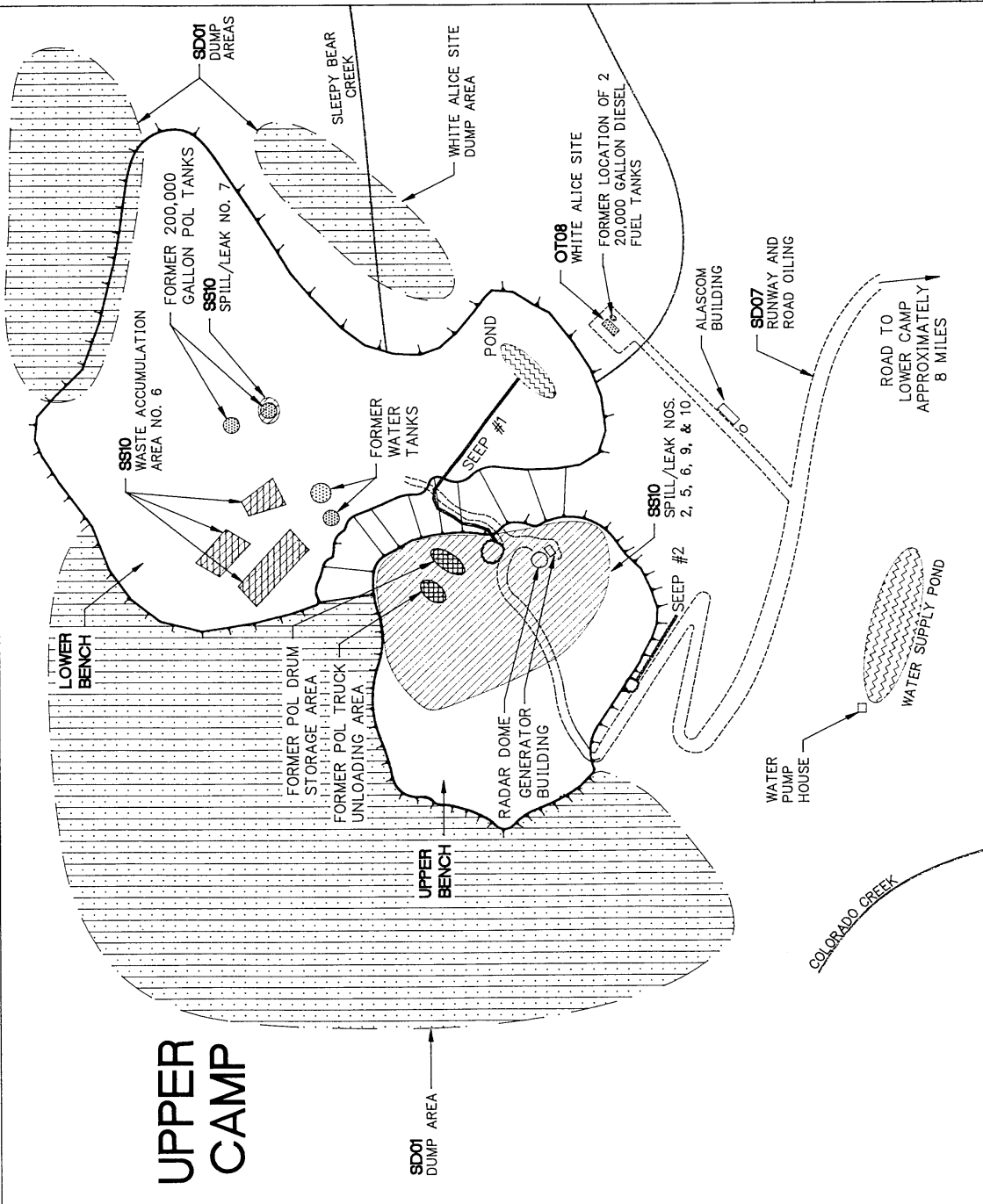
NOTE:  
ALL LOCATIONS ARE APPROXIMATE



INDIAN MOUNTAIN  
LONG RANGE RADAR STATION  
SOURCE MAP  
UPPER CAMP



PROJ. MGR.	AGAD FILE NO.	FIGURE NO.
L. SCHUEITTE	BASE 1-3	1-3
DRAWN BY	PROJ. NO.	DATE
HUNTER	05-G-46200	5/10/94





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TABLE 1-1  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-K005-A-1214 (0.5 feet)	<u>Volatiles (ug/kg)</u> Not Analyzed	Surface Soil	Groundwater	Human Station residents via ingestion, inhalation and dermal contact. Station commercial/ industrial workers (and contractor personnel) via ingestion.  Ecological Aquatic and terrestrial receptors if contaminants migrate from groundwater to surface water/sediment. Direct routes are ingestion and dermal contact if groundwater reaches surface water/sediment.	Human Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, in groundwater are likely to be of greatest concern if they are routinely ingested.  Ecological Aquatic and terrestrial receptors not thought to come in contact with groundwater.
	<u>Semivolatiles (ug/kg)</u> Not Analyzed				
	<u>Pesticides/PCBs (ug/kg)</u> alpha-BHC 8.7 Aldrin 8.3 4-4'-DDE 26 4-4'-DDD 5.8 4-4'-DDT 200				
	<u>Metals (mg/kg)</u> Aluminum 970 Antimony 12.4 Arsenic 1.3 Barium 77.1 Beryllium 0.73 Cadmium 1.5 Calcium 2,930 Chromium 3.6 Cobalt 2.9 Copper 7.1 Iron 1,400 Lead 16 Magnesium 801 Manganese 106 Mercury 0.31 Nickel 8 Potassium 1,080 Selenium 1.3 Silver 3.6 Sodium 426 Thallium 1.3 Vanadium 41 Zinc 32.9				

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-K005-A-1214 (0.5 feet) (cont'd)			Surface Water/ Sediment	<p><b>Human</b> Station residents via ingestion and dermal contact during recreational activities.</p> <p>Station commercial/ industrial workers (and contractor personnel) via ingestion and dermal contact.</p> <p><b>Ecological</b> Aquatic organisms may be exposed, some continuously, to contaminants. Direct routes are ingestion and dermal contact (including respiration).</p> <p>Terrestrial organisms may be exposed. Direct routes are ingestion of surface water/sediment, generally dermal contact is assumed to be minor.</p> <p>Some contaminants may be subject to plant uptake and subsequent transport up the food chain.</p>	<p><b>Human</b> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely contacted, which does not seem likely.</p> <p><b>Ecological</b> Potential risks to aquatic receptors. Risks are greatest to organisms residing where contaminants may concentrate (e.g., if contaminants concentrate in sediments, benthic macroinvertebrates would potentially be at greater risk).</p> <p>Potential risks to terrestrial species that drink water or feed in aquatic habitats.</p>
			Air	<p><b>Human</b> Station residents via inhalation during recreational activities.</p> <p>Station commercial/ industrial workers (and contractor personnel) via inhalation.</p> <p><b>Ecological</b> Terrestrial organisms via inhalation. Plant uptake potential.</p> <p>Aquatic organisms not thought to be exposed.</p>	<p><b>Human</b> Potential risks to humans are likely to be minimal as conditions at Indian Mountain would encourage rapid and substantial dispersion of any air contaminants.</p> <p><b>Ecological</b> Potential risks assumed to be minimal for most Indian Mountain species. Special habitat and life history traits could result in exposure for some species (e.g., burrowing or subterranean terrestrial species).</p>

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-5015-A-1213 (15 feet)	<p><u>Volatiles (ug/kg)</u></p> <p>Not Analyzed</p> <p><u>Semivolatiles (ug/kg)</u></p> <p>Not Analyzed</p> <p><u>Pesticides/PCBs (ug/kg)</u></p> <p>4-4'-DDT 1.2 J</p> <p><u>Metals (mg/kg)</u></p> <p>Aluminum 5,540 U</p> <p>Antimony 4.8 J</p> <p>Arsenic 26 J</p> <p>Barium 93.3 U</p> <p>Beryllium 0.28 U</p> <p>Cadmium .56 U</p> <p>Calcium 1,600</p> <p>Chromium 5.5 J</p> <p>Cobalt 3.8 J</p> <p>Copper 5.5 J</p> <p>Iron 7,000</p> <p>Lead 6.3 J</p> <p>Magnesium 1,060</p> <p>Manganese 36.9</p> <p>Mercury 0.11 U</p> <p>Nickel 5.3 J</p> <p>Potassium 303 J</p> <p>Selenium 0.57 U</p> <p>Silver 14 U</p> <p>Sodium 466 J</p> <p>Thallium 0.57 J</p> <p>Vanadium 14.6 U</p> <p>Zinc 15.2</p>	Subsurface Soil	Groundwater	<p><b>Human</b></p> <p>Station residents via ingestion, inhalation and dermal contact.</p> <p>Station commercial/Industrial workers (and contractor personnel) via ingestion.</p> <p><b>Ecological</b></p> <p>Aquatic and terrestrial receptors if contaminants migrate from groundwater to surface water/sediment. Direct routes are ingestion and dermal contact if groundwater reaches surface water/sediment.</p>	<p><b>Human</b></p> <p>Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, in groundwater are likely to be of greatest concern if they are routinely ingested.</p> <p><b>Ecological</b></p> <p>Aquatic and terrestrial receptors not thought to come in contact with groundwater.</p>

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-E003-A-1211 Indian River	<u>Volatiles (ug/kg)</u>	Sediment	Groundwater	Human Station residents via ingestion, inhalation and dermal contact. Station commercial/Industrial workers (and contractor personnel) via ingestion.  Ecological Aquatic and terrestrial receptors if contaminants migrate from groundwater to surface water/sediment. Direct routes are ingestion and dermal contact if groundwater reaches surface water/sediment.	Human Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, in groundwater are likely to be of greatest concern if they are routinely ingested.  Ecological Aquatic and terrestrial receptors not thought to come in contact with groundwater.
	Not Analyzed				
	<u>Semivolatiles (ug/kg)</u>				
	Not Analyzed				
	<u>Pesticides/PCBs (ug/kg)</u>				
	None Detected				
	<u>Metals (mg/kg)</u>				
	Aluminum				
	Antimony				
	Arsenic				
	Barium				
	Beryllium				
	Cadmium				
	Calcium				
	Chromium				
	Cobalt				
	Copper				
	Iron				
	Lead				
	Magnesium				
	Manganese				
	Mercury				
	Nickel				
	Potassium				
	Selenium				
	Silver				
	Sodium				
	Thallium				
	Vanadium				
	Zinc				

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-E003-A-1211 Indian River (cont'd)			Surface Water	<p><u>Human</u> Station residents via ingestion and dermal contact during recreational activities.</p> <p>Station commercial/ industrial workers (and contractor personnel) via ingestion and dermal contact.</p> <p><u>Ecological</u> Aquatic organisms may be exposed, some continuously, to contaminants. Direct routes are ingestion and dermal contact (including respiration).</p> <p>Terrestrial organisms may be exposed. Direct routes are ingestion of surface water/sediment, generally dermal contact is assumed to be minor.</p> <p>Some contaminants may be subject to plant uptake and subsequent transport up the food chain.</p>	<p><u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely contacted, which does not seem likely.</p> <p><u>Ecological</u> Potential risks to aquatic receptors. Risks are greatest to organisms residing where contaminants may concentrate (e.g., if contaminants concentrate in sediments, benthic macroinvertebrates would potentially be at greater risk).</p> <p>Potential risks to terrestrial species that drink water or feed in aquatic habitats.</p>

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-E003-A-1211 Indian River (cont'd)			Soil	<p><u>Human</u> Station residents via dermal contact and ingestion, especially during recreational activities.</p> <p>Station commercial/Industrial workers (and contractor personnel) via ingestion and dermal contact.</p> <p><u>Ecological</u> Aquatic organisms not exposed. Terrestrial organisms exposed via ingestion and dermal contact. Presumed less contact through inhalation.</p>	<p><u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely directly contacted, which does not seem likely.</p> <p>Concern would be great if soil were potentially contaminated, and likely to be exposed in residential areas, and if there were children, which does not seem likely.</p> <p><u>Ecological</u> Potential risks to aquatic organisms only if contamination migrates to surface water/sediment (see surface water/sediment model).</p> <p>Potential risk to terrestrial organisms. Greater risk for species most directly associated with soil (e.g., through feeding, nest sites, etc.).</p>

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
			Air	<p><u>Human</u> Station residents via Inhalation during recreational activities.</p> <p>Station commercial/Industrial workers (and contractor personnel) via Inhalation.</p> <p><u>Ecological</u> Terrestrial organisms via Inhalation. Plant uptake potential.</p> <p>Aquatic organisms not thought to be exposed.</p>	<p><u>Human</u> Potential risks to humans are likely to be minimal as conditions at Indian Mountain would encourage rapid and substantial dispersion of any air contaminants.</p> <p><u>Ecological</u> Potential risks assumed to be minimal for most Indian Mountain species. Special habitat and life history traits could result in exposure for some species (e.g., burrowing or subterranean terrestrial species).</p>



TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-E005-A-1238 Utopia Creek	<p><u>Volatiles (ug/kg)</u> Not Analyzed</p> <p><u>Semivolatiles (ug/kg)</u> Not Analyzed</p> <p><u>Pesticides/PCBs (ug/kg)</u> None Detected</p> <p><u>Metals (mg/kg)</u> Aluminum 14,400 Antimony 47 Arsenic 105 Barium 160 Beryllium 0.83 Cadmium 17 Calcium 6,020 Chromium 8.2 Cobalt 14.7 Copper 74.6 Iron 31,700 Lead 47 Magnesium 9,310 Manganese 684 Mercury 0.1 Nickel 8.4 Potassium 301 Selenium 0.65 Silver 1.1 Sodium 427 Thallium 0.5 Vanadium 66.8 Zinc 397</p>	Sediment	Groundwater	<p><u>Human</u> Station residents via ingestion, inhalation and dermal contact. Station commercial/ industrial workers (and contractor personnel) via ingestion.</p> <p><u>Ecological</u> Aquatic and terrestrial receptors if contaminants migrate from groundwater to surface water/sediment. Direct routes are ingestion and dermal contact if groundwater reaches surface water/sediment.</p>	<p><u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present or potentially present in groundwater are likely to be of greatest concern if they are routinely ingested.</p> <p><u>Ecological</u> Aquatic and terrestrial receptors not thought to come in contact with groundwater. However, potential risks to receptors if contaminated groundwater migrates to surface waters or wetland areas (see groundwater/sediment model).</p>

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-E005-A-1238 Utopia Creek (cont'd)		Groundwater	Surface Water/ Sediment	<p><u>Human</u> Station residents via ingestion and dermal contact during recreational activities.</p> <p>Station commercial/Industrial workers (and contractor personnel) via ingestion and dermal contact.</p> <p><u>Ecological</u> Aquatic organisms may be exposed, some continuously, to contaminants. Direct routes are ingestion and dermal contact (including respiration).</p> <p>Terrestrial organisms may be exposed. Direct routes are ingestion of surface water/sediment, generally dermal contact is assumed to be minor.</p> <p>Some contaminants may be subject to plant uptake and subsequent transport up the food chain.</p>	<p><u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely contacted, which does not seem likely.</p> <p><u>Ecological</u> Potential risks to aquatic receptors. Risks are greatest to organisms residing where contaminants may concentrate (e.g., if contaminants concentrate in sediments, benthic macroinvertebrates would potentially be at greater risk).</p> <p>Potential risks to terrestrial species that drink water or feed in aquatic habitats.</p>

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-E005-A-1238 Utopia Creek (cont'd)			Soil	<p><u>Human</u> Station residents via dermal contact and ingestion, especially during recreational activities.</p> <p>Station commercial/Industrial workers (and contractor personnel) via ingestion and dermal contact.</p> <p><u>Ecological</u> Aquatic organisms not exposed. Terrestrial organisms exposed via ingestion and dermal contact. Presumed less contact through inhalation.</p>	<p><u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely directly contacted, which does not seem likely.</p> <p>Concern would be great if soil were potentially contaminated, and likely to be exposed in residential areas, and if there were children, which does not seem likely.</p> <p><u>Ecological</u> Potential risks to aquatic organisms only if contamination migrates to surface water/sediment (see surface water/sediment model).</p> <p>Potential risk to terrestrial organisms. Greater risk for species most directly associated with soil (e.g., through feeding, nest sites, etc.).</p>

TABLE 1-1 (continued)  
WOODWARD-CLYDE 1993 BACKGROUND CONTAMINANT CONCENTRATIONS  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Background Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-E005-A-1238 Utopia Creek (cont'd)			Air	<p><u>Human</u> Station residents via inhalation during recreational activities.</p> <p>Station commercial/ industrial workers (and contractor personnel) via inhalation.</p> <p><u>Ecological</u> Terrestrial organisms via inhalation. Plant uptake potential.</p> <p>Aquatic organisms not thought to be exposed.</p>	<p><u>Human</u> Potential risks to humans are likely to be minimal as conditions at Indian Mountain would encourage rapid and substantial dispersion of any air contaminants.</p> <p><u>Ecological</u> Potential risks assumed to be minimal for most Indian Mountain species. Special habitat and life history traits could result in exposure for some species (e.g., burrowing or subterranean terrestrial species).</p>

Reference: U.S. Air Force, 1993

Notes: The qualifier "J" indicates the result is an estimate; "U" indicates the parameter was not detected; values shown indicate the detection limit if available.

µg/kg = micrograms per kilogram  
 DDE = dichlorodiphenyldichloroethylene  
 DDT = dichlorodiphenyltrichloroethane  
 DDD = dichlorodiphenyldichloroethane  
 BHC = hexachlorocyclohexane  
 mg/kg = milligrams per kilogram  
 PCBs = polychlorinated biphenyls

TABLE 1-2  
MAXIMUM ORGANIC CONTAMINANT CONCENTRATIONS IN SOIL  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Contaminant Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
	<u>Volatiles (ug/kg)</u>	Surface Soil	Groundwater	Human Station residents via ingestion, inhalation and dermal contact. Station commercial/Industrial workers (and contractor personnel) via ingestion. Ecological Aquatic and terrestrial receptors if contaminants migrate from groundwater to surface water/sediment. Direct routes are ingestion and dermal contact if groundwater reaches surface water/sediment.	Human Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, in groundwater are likely to be of greatest concern if they are routinely ingested.  Ecological Aquatic and terrestrial receptors not thought to come in contact with groundwater.
	Benzene	14	J		
	Toluene	1	J		
	Ethylbenzene	8	J		
	Xylene (total)	6	J		
	Tetrachloroethene	1	J		
	Chlorobenzene	0.2	J		
	Carbon disulfide	16	J		
	<u>Semivolatiles (ug/kg)</u>				
	None Detected				
	<u>Pesticides/PCBs (ug/kg)</u>				
	4-4'-DDE	44	J		
	4-4'-DDD	270	J		
	4-4'-DDT	580	J		
	Arochlor 1260	14	J		
	alpha-BHC	8.7	J		
	Aldrin	8.3	J		

TABLE 1-2 (continued)  
MAXIMUM ORGANIC CONTAMINANT CONCENTRATIONS IN SOIL  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Contaminant Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
			Surface Water/ Sediment	<p><u>Human</u> Station residents via Ingestion and dermal contact.</p> <p>Station commercial/Industrial workers (and contractor personnel) via Ingestion and dermal contact.</p> <p><u>Ecological</u> Aquatic organisms may be exposed, some continuously, to contaminants. Direct routes are Ingestion and dermal contact (including respiration).</p> <p>Terrestrial organisms may be exposed. Direct routes are Ingestion of surface water/sediment, generally dermal contact is assumed to be minor.</p> <p>Some contaminants may be subject to plant uptake and subsequent transport up the food chain.</p>	<p><u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely contacted, which does not seem likely.</p> <p><u>Ecological</u> Potential risks to aquatic receptors. Risks are greatest to organisms residing where contaminants may concentrate (e.g., if contaminants concentrate in sediments, benthic macroinvertebrates would potentially be at greater risk).</p> <p>Potential risks to terrestrial species that drink water or feed in aquatic habitats.</p>
			Air	<p><u>Human</u> Station residents via Inhalation during recreational activities.</p> <p>Station commercial/Industrial workers (and contractor personnel) via Inhalation.</p> <p><u>Ecological</u> Terrestrial organisms via Inhalation. Plant uptake potential.</p> <p>Aquatic organisms not thought to be exposed.</p>	<p><u>Human</u> Potential risks to humans are likely to be minimal as conditions at Indian Mountain would encourage rapid and substantial dispersion of any air contaminants.</p> <p><u>Ecological</u> Potential risks assumed to be minimal for most Indian Mountain species. Special habitat and life history traits could result in exposure for some species (e.g., burrowing or subterranean terrestrial species).</p>

TABLE 1-2 (continued)  
MAXIMUM ORGANIC CONTAMINANT CONCENTRATIONS IN SOIL  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Contaminant Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
	<u>Volatiles (µg/kg)</u>	Subsurface soil	Groundwater	Human Station residents via ingestion, inhalation and dermal contact. Station commercial/ industrial workers (and contractor personnel) via ingestion.  Ecological Aquatic and terrestrial receptors if contaminants migrate from groundwater to surface water/sediment. Direct routes are ingestion and dermal contact if groundwater reaches surface water/sediment.	Human Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, in groundwater are likely to be of greatest concern if they are routinely ingested.  Ecological Aquatic and terrestrial receptors not thought to come in contact with groundwater.
	Benzene	1	J		
	Toluene	65	J		
	Ethylbenzene	0.4	J		
	Xylene (total)	4	J		
	Tetrachloroethene	3	J		
	Carbon disulfide	0.3	J		
	<u>Semivolatiles (µg/kg)</u>				
	N-nitroso-diphenylamine	500	J		
	Phenanthrene	650	J		
	Fluoranthene	400	J		
	Phenol	230	J		
	<u>Pesticides/PCBs (µg/kg)</u>				
	4-4'-DDE	13	J		
	4-4'-DDD	28	J		
	4-4'-DDT	270	J		

Reference: U.S. Air Force, 1993

Notes: The qualifier "J" indicates the result is an estimate; "U" indicates the parameter was not detected; values shown indicate the detection limit if available.

µg/kg = micrograms per kilogram  
DDE = dichlorodiphenyldichloroethylene  
DDT = dichlorodiphenyltrichloroethane  
DDD = dichlorodiphenyldichloroethane  
BHC = hexachlorocyclohexane  
PCBs = polychlorinated biphenyls

TABLE 1-3  
MAXIMUM INORGANIC CONTAMINANT CONCENTRATIONS IN SOIL  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Contaminant Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
	Metals (mg/kg)	Surface Soil	Groundwater	<u>Human</u> Station residents via Ingestion, Inhalation and dermal contact. Station commercial/Industrial workers (and contractor personnel) via Ingestion.	<u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, in groundwater are likely to be of greatest concern if they are routinely ingested.
	Aluminum 29,400			<u>Ecological</u> Aquatic and terrestrial receptors if contaminants migrate from groundwater to surface water/sediment. Direct routes are ingestion and dermal contact if groundwater reaches surface water/sediment.	<u>Ecological</u> Aquatic and terrestrial receptors not thought to come in contact with groundwater.
	Antimony 4.4				
	Arsenic 10.4				
	Barium 600				
	Beryllium 1.4				
	Cadmium 0.87				
	Calcium 10,100				
	Chromium 31				
	Cobalt 23.8				
	Copper 50.4				
	Iron 48,300				
	Lead 37.5				
	Magnesium 12,300				
	Manganese 1,580				
	Mercury 0.13				
	Nickel 31.7				
	Potassium 3,200				
	Selenium 0.65				
	Silver 1.3				
	Sodium 1,210				
	Thallium 0.52				
	Vanadium 120				
	Zinc 219				
		Surface Water/Sediment		<u>Human</u> Station residents via ingestion and dermal contact.  Station commercial/Industrial workers (and contractor personnel) via ingestion and dermal contact.	<u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely contacted, which does not seem likely.
				<u>Ecological</u> Aquatic organisms may be exposed, some continuously, to contaminants. Direct routes are ingestion and dermal contact (including respiration).  Terrestrial organisms may be exposed. Direct routes are ingestion of surface water/sediment, generally dermal contact is assumed to be minor.  Some contaminants may be subject to plant uptake and subsequent transport up the food chain.	<u>Ecological</u> Potential risks to aquatic receptors. Risks are greatest to organisms residing where contaminants may concentrate (e.g., if contaminants concentrate in sediments, benthic macroinvertebrates would potentially be at greater risk).  Potential risks to terrestrial species that drink water or feed in aquatic habitats.



TABLE 1-3 (continued)  
MAXIMUM INORGANIC CONTAMINANT CONCENTRATIONS IN SOIL  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Contaminant Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
			Air	<p><u>Human</u> Station residents via Inhalation during recreational activities.</p> <p>Station commercial/Industrial workers (and contractor personnel) via Inhalation.</p> <p><u>Ecological</u> Terrestrial organisms via Inhalation. Plant uptake potential.</p> <p>Aquatic organisms not thought to be exposed.</p>	<p><u>Human</u> Potential risks to humans are likely to be minimal as conditions at Indian Mountain would encourage rapid and substantial dispersion of any air contaminants.</p> <p><u>Ecological</u> Potential risks assumed to be minimal for most Indian Mountain species. Special habitat and life history traits could result in exposure for some species (e.g., burrowing or subterranean terrestrial species).</p>
		Subsurface soil	Groundwater	<p><u>Human</u> Station residents via Ingestion, Inhalation and dermal contact.</p> <p>Station commercial/Industrial workers (and contractor personnel) via Ingestion.</p> <p><u>Ecological</u> Aquatic and terrestrial receptors If contaminants migrate from groundwater to surface water/sediment. Direct routes are Ingestion and dermal contact if groundwater reaches surface water/sediment.</p>	<p><u>Human</u> Potential risks to humans as a result of the presence of all the contaminants listed as present, or potentially present, in groundwater are likely to be of greatest concern if they are routinely ingested.</p> <p><u>Ecological</u> Aquatic and terrestrial receptors not thought to come in contact with groundwater.</p>
	<p>Metals (mg/kg)</p> <p>Aluminum 27,200</p> <p>Antimony 7.7</p> <p>Arsenic 12.6</p> <p>Barium 229</p> <p>Beryllium 1.2</p> <p>Cadmium 0.96</p> <p>Calcium 12,800</p> <p>Chromium 29.1</p> <p>Cobalt 18.9</p> <p>Copper 55.2</p> <p>Iron 43,600</p> <p>Lead 40.6</p> <p>Magnesium 11,200</p> <p>Manganese 987</p> <p>Mercury 0.48</p> <p>Nickel 30.5</p> <p>Potassium 886</p> <p>Selenium 0.52</p> <p>Silver 1.3</p> <p>Sodium 599</p> <p>Thallium 0.51</p> <p>Vanadium 113</p> <p>Zinc 109</p>				

Reference: U.S. Air Force, 1993

Notes: The qualifier "J" indicates the result is an estimate; "U" indicates the parameter was not detected; values shown indicate the detection limit if available.

mg/kg = milligrams per kilogram

TABLE 1-4  
MAXIMUM ORGANIC/INORGANIC CONTAMINANT CONCENTRATIONS IN WATER  
INDIAN MOUNTAIN LRRS, ALASKA

Source Identification (Sample No.)	Contaminant Concentrations	Media	Migration Pathway	Exposed Population	Risk Assessment
IM-N000-A-1547 Water Supply Well	Volatiles (µg/L)	Groundwater	Surface Water/ Sediment	Human Station residents via Ingestion and dermal contact.	Human Potential risks to humans because of the presence of all the contaminants listed as present, or potentially present, may be of concern if they are routinely contacted, which does not seem likely.
	None Detected				
	Semivolatiles (µg/L)				
	None Detected				
	Pesticides/PCBs (µg/L)				
	None Detected				
	Metals (µg/L)				
	Aluminum				
	Antimony				
	Arsenic				
	Barium				
	Beryllium				
	Cadmium				
	Calcium				
	Chromium				
	Cobalt				
	Copper				
	Iron				
	Lead				
	Magnesium				
	Manganese				
	Mercury				
	Nickel				
	Potassium				
	Selenium				
	Silver				
	Sodium				
	Thallium				
	Vanadium				
	Zinc				

Reference: U.S. Air Force, 1993

Notes: The qualifier "J" indicates the result is an estimate; "U" indicates the parameter was not detected; values shown indicate the detection limit if available.

µg/L = micrograms per liter  
PCBs = polychlorinated biphenyls

### **1.2.2 Site Health and Safety Coordinator**

The Site Health and Safety Coordinator (SHSC) has the responsibility of implementing this HSP. The SHSC will investigate all accidents and incidents occurring at Indian Mountain LRRS. The SHSC will conduct safety briefings and site-specific training for onsite personnel. The SHSC will accompany all OSHA and other governmental agency personnel visiting the site in response to health and safety issues. The SHSC is responsible for modifying existing or developing new procedures, after consultation with the PHSM, when site or environmental conditions change because of natural causes or because of the conduct of site operations.

The SHSC will oversee Indian Mountain LRRS Health and Safety. All Jacobs injuries and mishaps will be reported to the SHSC and the PHSM.

The SHSC has "stop-work authorization" if an imminent hazard or potentially dangerous work practice is determined. Authorization to proceed with work will be verified by the PHSM. The SHSC will be responsible for implementing evacuation procedures that include shutting down of appropriate equipment, removing equipment from downrange areas, and coordinating necessary emergency services onsite. Jonathan Russ will be Jacobs' SHSC at Indian Mountain.

### **1.2.3 Project Manager**

The Project Manager for Indian Mountain LRRS has overall health and safety responsibility for full implementation of this HSP. In the Project Manager's absence, the Site Manager will assume overall health and safety responsibility. Lynn Schuetter is Jacobs' Project Manager for all work at Indian Mountain; Robert Henry is the Site Manager.

### **1.2.4 Team Members**

All team members will be responsible for understanding and complying with all site health and safety requirements. All members of this group will have been provided training regarding the hazards, their identification, and specific protection required in conducting the scope of work of this project

## 2.0 SCOPE OF WORK

The HSP will cover RI/FS activities at Indian Mountain LRRS. The purpose of RI/FS field activities is to determine the nature and extent of contamination at various sites at Indian Mountain LRRS. This HSP supports the following scope of work activities:

- Perform site reconnaissance surveys.
- Prefield training and preparation.
- Drill and sample boreholes at the Lower Camp to determine the geotechnical, geological, hydrogeological, and geochemical characteristics of the subsurface materials and determine whether contamination exists.
- Install and sample groundwater monitoring wells at Lower Camp to evaluate groundwater quality, potentiometric levels, hydrogeologic properties of the waterbearing units, and contaminant distribution within the aquifer.
- Perform water-level measurements and groundwater sampling.
- Perform surveying of monitoring wells and sample locations.
- Sample well borehole subsurface soil at Lower Camp.
- Power and hand auger boreholes and collect soil samples at Upper Camp and Lower Camp.
- Perform electromagnetic surveys at Upper Camp and Lower Camp.
- Perform limited soil vapor surveys at Upper Camp and Lower Camp.
- Sample surface soil, sediment, and surface water.
- Handle and manage decontamination and investigation-derived waste.
- Characterize purge water and soil cuttings.
- Sample drinking water at the water supply well.

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### 3.0 HAZARD ANALYSIS

#### 3.1 CHEMICAL HAZARDS

Chemicals of concern currently known to exist at Indian Mountain LRRS are presented in Table 3-1. The chemical hazard listing is based on the contaminants that have been detected or are historically associated with the processes at Indian Mountain LRRS. This list of chemicals will be updated as additional information regarding Indian Mountain LRRS is made available. In addition to the listing of chemicals, chemical properties and potential health effects are presented. Exposure to chemical contaminants at the site may result from the following:

- Inhalation of airborne contaminants: Air-purifying or air-supplied respirators will be worn by onsite personnel during operations if airborne contaminants exceed designated action levels (Section 7.0 provides details) or as determined in work-specific addenda to this plan.
- Skin contact with materials: Contact with chemical contaminants onsite could result in skin irritation, skin absorption, or other skin problems. Direct skin contact with chemically contaminated materials can be avoided by wearing protective gloves, coveralls, and boots. If skin contact with contaminants occurs, the exposed area will be washed thoroughly as soon as possible.
- Accidental ingestion of chemical contaminants: Contaminants can enter the body by ingestion. Drinking, eating, and smoking will not be allowed in the Contamination Reduction or Exclusion zones (see Section 9.0). Hands and faces will be washed and outer coveralls removed before drinking, eating, smoking, or leaving the Exclusion or Contamination Reduction zones.

All exposure values presented in Table 3-1 are based on an 8-hour time-weighted average (TWA) for airborne concentrations, unless otherwise stated. The lowest value between the OSHA Permissible Exposure Limit (PEL), National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs), and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) has been presented to maintain a conservative posture. Additionally, the Immediately Dangerous to Life and Health (IDLH) concentrations are presented in Table 3-1.

In addition to the specific chemical information presented in Appendix B, chemical compound groups are presented below. Compound groups are presented because of the many individual chemicals associated with Indian Mountain LRRS.

Corrosives. Corrosives include acids, bases or caustics, and inorganic halogen salts. Some of the more common acids include acetic, citric, hydrochloric, hydrofluoric, nitric, perchloric, phosphoric, picric, and sulfuric acids. Some of the more common caustics include ammonium hydroxide, potassium hydroxide, sodium hydroxide, and sodium hypochlorite. Inorganic halogen salts are compounds containing halogens (chlorine, bromine, fluorine) such as sodium chloride, potassium bromate, and sodium fluoride, which are corrosive to metals and finishes, but are relatively insignificant health threats.

TABLE 3-1  
CHEMICALS OF CONCERN AT  
INDIAN MOUNTAIN LONG RANGE RADAR STATION

COMPOUND	8-HOUR TWA (PPM) <sup>1</sup>	IDLH (PPM) <sup>2</sup>	SIGNS AND SYMPTOMS OF EXPOSURE
Arochlor 1260	0.5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>	Symptoms of exposure to Arochlor 1260 include chloracne, weakness of limbs, headache, dizziness, and general malaise. A suspected human carcinogen.
Arsenic	0.01 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>	This compound can cause systemic, skin, and gastrointestinal effects. It is a human carcinogen and an experimental teratogen, and there are mutagenic data. The REL for arsenic has a ceiling of 0.002 mg/m <sup>3</sup> .
Barium	0.5 mg/m <sup>3</sup>	1,100 mg/m <sup>3</sup>	Soluble barium compounds can cause upper respiratory, eye, and skin irritations. They also cause gastroenteritis, muscle spasms, and a slow pulse.
Benzene	1 ppm	3,000 ppm	Benzene is moderately toxic by inhalation, ingestion, and subcutaneous routes. It is a strong eye and mild skin irritant. When inhaled, it affects the central nervous system (narcotic effects) and blood system (leukemia). It is a human carcinogen and an experimental teratogen and tumorigen. There are also mutagenic data on this compound. The REL for benzene has a ceiling of oil ppm.
Beryllium	.002 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	Beryllium is a suspected human carcinogen. Acute exposures to high concentrations can cause dermatitis, tracheobronchitis, and pneumonitis. Chronic exposure to fine dust can cause lung disease.
Cadmium	0.05 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	Cadmium is poisonous to humans by inhalation and other routes. The effects are dependent on the cadmium compound. Cadmium dust is carcinogenic.
Carbon disulfide	1 ppm	500 ppm	Carbon disulfide is moderately toxic by inhalation. The chief effects are on the central nervous system, acting as a narcotic and anesthetic in acute poisoning. It is an experimental tetragen.
Chlorobenzene	75 ppm	2,400 ppm	Chlorobenzene is moderately toxic by inhalation, ingestion, and subcutaneous routes. It is a strong eye and mild skin irritant. When inhaled, it affects the central nervous system (narcotic effects) and blood system (leukemia). It is a human carcinogen and an experimental teratogen and tumorigen. There are also mutagenic data on this compound.

TABLE 3-1 (continued)  
CHEMICALS OF CONCERN AT  
INDIAN MOUNTAIN LONG RANGE RADAR STATION

COMPOUND	8-HOUR TWA (PPM) <sup>1</sup>	IDLH (PPM) <sup>2</sup>	SIGNS AND SYMPTOMS OF EXPOSURE
Chromium	0.05 mg/m <sup>3</sup>	NE	Chromium metal and insoluble salts are toxic by inhalation, and chromium (VI) is carcinogenic. The trivalent form is less toxic than the hexavalent.
Chrysene	0.2 mg/m <sup>3</sup>	NE	Chrysene has been shown to accumulate in adipose and mammary tissue. Long-term exposure in laboratory animals and epidemiologic studies have indicated that this compound is carcinogenic.
DDT	0.5 mg/m <sup>3</sup>	NE	DDT is poisonous by ingestion, skin contact, and subcutaneous exposures. It affects the central nervous system and is an experimental carcinogen, teratogen, and mutagen. DDT is stored in the fat of animals and bioaccumulates.
4-4'-DDE	0.5 mg/m <sup>3</sup>	NE	DDE is poisonous by ingestion, skin contact, and subcutaneous exposures. It affects the central nervous system and is an experimental carcinogen, teratogen, and mutagen. DDE is stored in the fat of animals and bioaccumulates.
4-4'-DDD	0.5 mg/m <sup>3</sup>	NE	DDD is poisonous by ingestion, skin contact, and subcutaneous exposures. It affects the central nervous system and is an experimental carcinogen, teratogen, and mutagen. DDD is stored in the fat of animals and bioaccumulates.
1,2-Dichloroethane (1,2-DCA)	200 ppm	400 ppm	1,2-DCA is primarily an irritant of the skin, eyes, and to some extent upper respiratory tract. Systematic absorption causes depression of the central nervous system.
Ethylbenzene	100 ppm	200 ppm	Ethylbenzene is primarily an irritant of the skin, eyes, and to some extent upper respiratory tract. Systematic absorption causes depression of the central nervous system.
Fluoranthene	0.1 mg/m <sup>3</sup>	700 mg/m <sup>3</sup>	Prolonged exposure to fluoranthene can produce chronic dermatitis and reproductive changes. Fluoranthene is considered a known carcinogen. Prolonged skin exposure has been linked to an increase in skin cancer among workers.



TABLE 3-1 (continued)  
CHEMICALS OF CONCERN AT  
INDIAN MOUNTAIN LONG RANGE RADAR STATION

COMPOUND	8-HOUR TWA (PPM) <sup>1</sup>	IDLH (PPM) <sup>2</sup>	SIGNS AND SYMPTOMS OF EXPOSURE
Lead	0.05 mg/m <sup>3</sup>	700 mg/m <sup>3</sup>	Lead is a poison by ingestion and can affect the central nervous system. Inhalation of lead dust can lead to carcinogenic effects in the lungs and kidneys. It is an experimental teratogen.
Methanol	200 ppm	25,000 ppm	Methanol is a poison by ingestion and skin contact, and it is moderately toxic by inhalation and other routes. It is an eye and skin irritant by inhalation. Its main effects are on the nervous system, particularly the optical nerves and possibly the retina, and can cause permanent blindness.
N-nitroso-phenylamine	2 ppm	100 ppm	Exposure routes include inhalation and absorption through skin or eyes. Affects the ability of blood to carry oxygen. Effects include skin discoloration, headache, weakness, drowsiness, shortness of breath and possibly unconsciousness.
Phenanthrene	0.1 mg/m <sup>3</sup>	700 mg/m <sup>3</sup>	Prolonged exposure to phenanthrene can produce chronic dermatitis and reproductive changes. Phenanthrene is considered a known carcinogen. Prolonged skin exposure has been linked to an increase in skin cancer among workers.
Polychlorinated Biphenyls (PCBs)	0.5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>	Symptoms of exposure to PCBs include chloracne, weakness of limbs, headache, dizziness, and general malaise.
Tetrachloroethylene (PCE)	25 ppm	500 ppm	PCE can affect the body through inhalation or absorption through eyes or skin. PCE may cause headache, nausea, dizziness from short term exposure and possible liver and kidney damage from long term exposure.
Toluene	100	2,000	This compound is moderately toxic by inhalation. Inhalation of this compound can cause an impairment of coordination and reaction time, headache, nausea, eye irritation, and loss of appetite. There are mutagenic data for this compound.
Phenol	5 ppm	250 ppm	Phenol is a colorless to light pink crystalline solid with a sweet acid odor, and has an odor threshold of 0.06 ppm. It is an eye and skin irritant.

TABLE 3-1 (continued)  
CHEMICALS OF CONCERN AT  
INDIAN MOUNTAIN LONG RANGE RADAR STATION

COMPOUND	8-HOUR TWA (PPM) <sup>1</sup>	IDLH (PPM) <sup>2</sup>	SIGNS AND SYMPTOMS OF EXPOSURE
1,1,1-Trichloroethane (1,1,1-TCA)	350 ppm	500 ppm	1,1,1-TCA is moderately toxic by ingestion. In humans, it can cause psychotropic, gastrointestinal, and central nervous system effects. It is also a moderate skin and eye irritant.
Trichloroethene (TCE)	25 ppm	500 ppm	TCE is toxic by inhalation and ingestion. Inhalation of this compound can cause headaches and drowsiness. It is also a strong skin and eye irritant. There are mutagenic data, and it is an experimental teratogen, carcinogen, and tumorigen.
Xylenes (total)	100 ppm	1,000 ppm	It is moderately toxic by inhalation and ingestion, causing systemic irritant effects. This compound causes severe eye irritation with some temporary conjunctival irritation possible, and is a moderate skin irritant.

Notes:

1 8-hour time weighted average. Shown concentration is either the PEL or TLV, whichever is lower.

2 Immediately dangerous to life and health.

DDE = dichlorodiphenyldichloroethylene

DDT = dichlorodiphenyltrichloroethane

DDD = dichlorodiphenyldichloroethane

mg/m3 = milligrams per cubic meter

ppm = parts per million

NE = no evidence could be found for the existence of a TWA or IDLH concentration

Sources:

Sax and Lewis, *The Hazardous Chemicals Desk Reference*, 1987.

NIOSH/OSHA *Occupational Health Guidance for Chemical Hazards*, 1981.

*Pocket Guide to Chemical Hazards*, 1991.

For the most part, corrosives are nonflammable, although the liquid forms are moderately to highly volatile. Picric acid, when dry, and perchloric acid (perchlorates) can be explosive.

The primary routes of entry into the body are through inhalation, ingestion, and skin contact. Symptoms of exposure include tissue burns, nose and throat inflammation, and pulmonary edema. Corrosives can cause extensive damage to the respiratory system, skin, and eyes.

Landfill Gases. In the past, landfills were often uncontrolled to the extent that almost any type of waste materials could have been deposited. When organic and inorganic matter degrades and decomposes, gases are generated, typically including, though not limited to, methane, ethane, ammonia, carbon dioxide, carbon disulfide, hydrogen chloride, hydrogen fluoride, hydrogen cyanide, hydrogen sulfide, vinyl chloride, vinyl fluoride, and vinylidene chloride. These gases are flammable and extremely volatile. Most of the gases are heavier than air (e.g., hydrogen sulfide) and settle in low-lying places.

The primary routes of entry into the body are through inhalation and skin absorption. Symptoms of exposure include lightheadedness, giddiness, nausea, headache, numb extremities, dermatitis, loss of appetite, chemical pneumonia, and tremors. Exposure to elevated levels of these gases can damage the skin, eyes, and respiratory system and can lead to death.

Metals. Metals commonly associated with batteries, paints, plating operations, and petroleum-based products include inorganic lead compounds, arsenic, cadmium (a probable human carcinogen), chromium (a probable human carcinogen), copper, nickel, silver, tin, and zinc compounds. Petroleum-based products, such as lubricants and especially leaded gasolines, contain organic lead compounds such as tetraethyl and tetramethyl lead, as well as assorted inorganic metals mentioned above and others such as antimony, barium, beryllium, cobalt, magnesium, manganese, and vanadium. Beryllium is a very highly toxic metal.

Metals present a health hazard in their solid form, especially as airborne dusts. The primary routes of entry into the body are through inhalation, ingestion, and skin contact. Organic compounds such as tributyltin may penetrate the skin without producing appreciable local injury. Symptoms of exposure include eye, skin, and upper respiratory system irritation; headache; insomnia; metallic taste in the mouth; lassitude; pallor; anorexia; constipation; abdominal pain; anemia; and tremors. Heavy metals can cause damage to the central nervous system, kidneys, respiratory system, and liver. Cancers of the lungs and bones are associated with metal intoxication.

Toxic Metals. The exposure potential to toxic metals at Indian Mountain LRRS is unknown. The principal routes of entry may be inhalation of airborne dust particles, ingestion, or direct contact with the eyes. Acute exposure to heavy metals may produce eye irritation, metal taste, irritated pharynx, and allergic asthma. Hexavalent chromium is a suspected carcinogen. Long-term overexposure to heavy metals has been associated with blood changes, gastrointestinal disturbances, kidney damage, altered spermatogenesis, and anemia.

Pesticides. The mode of organophosphorus and carbamate insecticides is to inhibit the enzyme acetylcholinesterase. Organophosphates have high dermal toxicities and carbamates have low dermal toxicities. Typical signs and symptoms of

poisoning from these pesticides are increased salivation, tearing and sweating, twitching, cramps, convulsions, and death. Common insecticides in these classes of pesticide include diazinon, malathion, parathion (organophosphates), and baygon, carbaryl, chlorpropham, and aldicarb (carbamates). These insecticides are closely related to chemical warfare agents. Organochlorine insecticides were widely used in agriculture, soil, and structure insect control from the mid-1940s to mid-1960s. Organochlorine insecticides are considered to be less acutely toxic, but have a greater potential for chronic toxicity due to their persistence and bioaccumulative ability.

Polychlorinated Biphenyls (PCBs). PCBs are highly persistent and bioaccumulative as pollutants. Their acute toxicity is low but their chronic toxicities are very similar to chlorinated pesticides. They are liver toxins with long-term exposure, and at high doses have caused suppression of the immune system, reproductive dysfunction, birth defects, and liver tumors. PCBs are considered a suspect carcinogen.

Petroleum-based Hydrocarbons. Lubricants, oils, fuels, and gasoline contain petroleum-based hydrocarbons such as benzene and its derivatives, naphthas, toluene, xylenes, and coal tar pitch volatiles. Coal tar pitch volatiles are also known as polycyclic hydrocarbons (PCHs) or polynuclear aromatics (PNAs). Benzene and certain PNAs are known carcinogens. Petroleum-based hydrocarbon materials generally contain metal contaminants. Lubricants and waste oils are slightly to highly volatile and flammable. Obviously, fuels and gasoline are extremely volatile and flammable.

The primary routes of entry into the body are through ingestion and skin contact or dermal absorption. Inhalation of the more volatile constituents, toluene, xylenes, naphthas, and benzene and its derivatives, can be toxic. Acute symptoms of exposure include eye, skin, and upper respiratory system irritation; giddiness; confusion; headache; nausea; staggered gait; and fatigue. High-level and chronic exposure can cause damage to the liver, kidneys, and bone marrow, and can cause skin cancer and leukemia.

Solvents (halogenated). Halogenated solvents are hydrocarbon compounds that also have halogen molecules such as chlorine, bromine, and fluorine. Generally, halogenated solvents are moderately to highly volatile and are noncombustible.

Some of the more common chlorinated solvent wastes include carbon tetrachloride, chloroform, methylene chloride, tetrachloroethylene (perchloroethylene) (all probable human carcinogens), methyl chloroform (1,1,1-trichloroethane), and trichloroethylene (TCE).

Primary routes of entry into the body are inhalation, dermal absorption, and ingestion. Symptoms of acute exposure include eye, skin, and upper respiratory irritation; flushed face and neck; headache; dizziness; fatigue; nausea; vomiting; confusion; and poor equilibrium. High level or chronic exposures can cause damage to the skin, eyes, liver, kidneys, central nervous system, respiratory system, and heart.

Solvents (nonhalogenated) and Paints. Some of the more common constituents of nonhalogenated solvent and paint wastes include acetone, methyl ethyl ketone (MEK), toluene, xylenes, alkyl acetates, acrylates, and alcohols. These substances are slightly to highly volatile and are moderately to highly flammable.

Primary routes of entry into the body are inhalation, ingestion, and dermal adsorption. Symptoms of exposure include irritation of the eyes, skin, or upper respiratory system; headache; drowsiness; dermatitis; dizziness; confusion; giddiness; and euphoria. Higher levels of exposure can cause narcosis and damage to the kidneys and blood.

### **3.2 PHYSICAL HAZARDS**

Potential physical hazards associated with field activities at the site include slips, trips, and falls; exposure to splashes and spills; noise; blunt trauma; and cold exposure and heat stress. Personnel must be aware that wearing the protective equipment may limit dexterity and visibility, and may increase the difficulty of performing some tasks.

#### **3.2.1 Slips, Trips, and Falls**

Field personnel will become familiar with the general terrain and potential physical hazards (ravines, pot holes, and loose gravel) that could be associated with accidental slips, trips, and falls. Slip, trip, and fall hazards at Indian Mountain LRRS are prevalent because of the uneven nature of the terrain. In addition, hazards are often hidden by dense vegetation. It is imperative that personnel look before they step.

#### **3.2.2 Splashes and Spills**

Field personnel will wear appropriate chemical-resistant gloves and goggles to prevent dermal exposure to accidental splashes and spills that may occur during sample container preservation, as well as groundwater and surface water sampling activities.

#### **3.2.3 Noise**

The main sources of noise for this project will be the drill rig, vehicles, and electric generators. Machinery associated with drilling is extremely noisy while in operation and can emit potentially harmful levels of noise into the surrounding work area. Hearing protection must be worn within at least 30 feet of the drill rig (i.e., hearing protection is required when at 3 feet apart, voices must be raised to be heard in normal conversation). The PEL for noise is 85 decibels on the A-weighted scale (dBA).

#### **3.2.4 Precariously Positioned Objects**

Field personnel will become familiar with the general area and the potential physical hazards associated with debris or objects piled or scattered around the sites. If objects are stacked in an unsafe manner, the SHSC will notify the 11th Civil Engineering Operations Squadron (CEOS) point of contact, who will transmit the information to Indian Mountain LRRS site personnel. Field activities will not begin until Station personnel remove or restack the objects in a safe manner.

### 3.2.5 Cold Exposure

Cold injury (frostbite and hypothermia) and the impaired ability to work are dangers at low temperatures when the wind-chill factor is high. Table 3-2 shows the effects that wind has on actual temperatures.

Persons working outdoors in temperatures at or below freezing may become frostbitten. Local injury resulting from cold is included in the generic term frostbite. Extremities such as fingers, toes, and ears are the most susceptible. There are several degrees of damage. Frostbite of the extremities can be placed into the following categories:

- frost nip or incipient frostbite - characterized by sudden blanching or whitening of skin;
- superficial frostbite - skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient; and
- deep frostbite - tissues are cold, pale, and solid; these symptoms indicate an extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: (1) shivering; (2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95 degrees Fahrenheit (°F); (3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; (4) freezing of the extremities; and finally, (5) death.

Fulfilling one or more of the following recommendations will help reduce cold stress:

- Install heaters in the support zone and trailers for a warming area for site personnel.
- Provide warm sweet drinks or soups at the work site for caloric intake and fluid volume. (Note: the intake of coffee should be limited because of diuretic and circulatory effects).
- Carefully schedule work and rest periods.
- Monitor workers' physical conditions.

Procedures for cold stress monitoring are found in Jacobs Standard Operating Procedure (SOP) 7-2 (Appendix C).

### 3.2.6 Heat Stress/Exhaustion

Site employees must learn to recognize and treat various forms of heat stress through preventive heat stress management, especially when higher levels of personal protective equipment (PPE) are required. In temperatures above 75 °F, the following rule shall be followed:

- Provide sufficient amounts of water to facilitate rehydration for each worker. Provide workers with a cool place for rest breaks. Monitor for signs of heat stress.

TABLE 3-2  
COOLING POWER OF WIND ON EXPOSED FLESH  
EXPRESSED AS AN EQUIVALENT TEMPERATURE  
(under calm conditions)\*

ESTIMATED WIND SPEED (in mph)	ACTUAL TEMPERATURE READING (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < 1 hour with dry skin. Maximum danger of false sense of security.			INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

\*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA

Note:

mph = miles per hour

The following are examples of heat-related stress that may be encountered:

- Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Symptoms include a decreased ability to tolerate heat and obvious signs of discomfort.
- Heat cramps are caused by profuse perspiration with inadequate fluid intake and salt replacement. Symptoms include muscle spasms and pain in the extremities and abdomen.
- Heat exhaustion is caused by increased stress on various organs to meet the increased demands on the body. Symptoms include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and lassitude.
- Heat stroke is the most severe form of heat stress. The body must be cooled immediately to prevent severe injury or death. Symptoms include red, hot, dry, skin; no perspiration; nausea; dizziness; confusion; strong rapid pulse; and coma.

For strenuous field activities that are part of an ongoing site activities in hot weather, a field monitoring program will be performed on each field person to monitor the body's physical response to heat and work stress. Procedures for heat stress monitoring are found in Jacobs SOP 7-1 (Appendix D).

### **3.2.7 Electrical Transmission Lines**

Any overhead wire will be considered an energized line unless the owner of a line or the electrical utility authorities indicates that it is not energized and the line has been visibly grounded.

A person will be designated to observe equipment in operation and to give timely warning of all situations where it will be difficult for the operator to maintain the desired clearance by visual means.

All parts of drill rigs, derrick trucks, or other lifting equipment working in the area of energized or unidentified overhead electrical lines will maintain a minimum clearance of 30 feet from such lines. The reduction of risks related to underground utilities is further discussed in Appendix E (Jacobs' SOP 7-7).

### **3.2.8 Welding/Cutting**

There are a number of inherent hazards associated with the use of an oxy-fuel cutting apparatus typically used in welding/cutting. The safety procedures below will be followed to minimize potential injuries:

- Welding/cutting activities will be conducted by qualified personnel only.
- Wear appropriate clothing to protect against sparks, flying slag, and flame brilliance at all times.
- Wear goggles with tempered lenses to protect eyes from injury.
- Protective gloves, sleeves, aprons, and shoes will be worn to protect skin and clothing from sparks and slag.



- Inspect all tools and equipment before use.
- Each welder or cutter should have at least one 10-pound, all purpose, fire extinguisher at the work area.
- Do not weld, cut, or grind drums, containers, or hollow structures that may have contained toxic or flammable substances until air monitoring is complete.
- Welding/cutting activities will only be conducted in the presence of a safety observer.

### **3.2.9 All Terrain Vehicle Operation**

Because of the remoteness and the resulting access problem for areas of investigation at Indian Mountain LRRS and the surrounding area, an all terrain vehicle (ATV) will be used. Field personnel will become familiar with all operational procedures associated with the ATV. Safety guidelines for operating the ATV will also be reviewed. Field team members operating ATVs will wear appropriate protective equipment (i.e., eye protection and helmet) at all times. Field personnel will become familiar with the general area and potential physical hazards associated with the site. Areas determined to be unsafe for ATV use will be avoided.

## **3.3 HAZARDS BY WORK TASKS**

### **3.3.1 Electromagnetic Surveys and Monitoring Well/Location Land Surveying**

The electromagnetic surveys and monitoring well/location land surveys will be conducted at different work sites throughout Indian Mountain LRRS. The ground and walking surfaces will vary with each site. The proper footwear must be worn. Footwear for the completion of these surveys must be made of a rugged material, have a nonslip sole, and provide good support and comfort. For these surveys, steel-toed boots will be required. In the event steel-toed boots interfere with electromagnetic surveys, an authorized, appropriate hard-toed boot will be substituted for steel-toed boots. Survey personnel will wear modified Level D PPE consisting of street clothes. Shorts and tank-top shirts will not be allowed. When walking in open terrain, the following will be observed:

- The open terrain in some areas is particularly susceptible to earth movement and slides immediately after a medium or heavy rainfall.
- Workers should be particularly attentive to the area in front of them. It is possible that wells, pits, holes, or similar hazards may be present and visually obstructed.

### **3.3.2 Borehole Drilling and Monitoring Well Construction**

Hazards associated with borehole drilling and monitoring well construction are potential contaminant inhalation and the physical hazards associated with using drilling rigs and equipment. Specific drill rig operation and safety requirements are presented in Appendix F.

Inhalation hazards associated with these tasks will be addressed through real-time air monitoring within the site personnel breathing zone. Air monitoring will be

completed using a flame ionization detector (FID) or photoionization detector (PID), combustible gas indicator (CGI), and other chemical-specific real-time air instrumentation as necessary. Air monitoring will be conducted in the breathing zone of site personnel. Vapor concentrations for each location will be documented in field logbooks and sampling reports.

If readings in the breathing zone are above background during air monitoring, workers will evacuate the vicinity in an upwind direction. If air concentrations in the worker breathing zone continue to exceed action background levels, the level of personal protection will be based on the contaminants associated with the site and the action levels specified in Section 7.0. Air monitoring at the drilling location will be conducted at 15-minute intervals.

When vapor readings are at background levels, Level D PPE will be used. For these tasks, Level D PPE will include coveralls, steel-toed boots, work/sample gloves, safety glasses, and a hardhat.

When conducting drilling operations within landfills, oxygen (O<sub>2</sub>)/lower explosive limit (LEL) monitoring will be performed continuously. Additionally, an organic vapor analyzer (OVA) type FID will be used to detect the presence of methane.

### **3.3.3 Environmental Media Sampling, Monitoring Well Development, Water Level Measurements, and Aquifer Testing**

Hazards associated with environmental media sampling, monitoring well development, water level measurements, and aquifer testing include contaminant exposure through inhalation or dermal absorption, and slips, trips, and falls. Environmental media sampling includes collecting groundwater, surface water, sediment, and subsurface and surface soil samples.

Stream sampling will be conducted by a field team consisting of at least two members to allow a minimum of one team member to observe and assist the second field team member conducting activities in the stream. If the stream bed exhibits rocky and uneven terrain, a safety line will be attached to the field team member conducting activities in the stream and anchored to a fixed object located on the stream bank. The field team member conducting activities in the stream will wear a U.S. Coast Guard approved life preserver at all times.

Personnel will not wade into streams to collect samples if the product of water velocity (feet per second) times water depth (feet) exceeds 10, because conditions are unsafe. Water velocity will be measured with a flowmeter.

To determine the potential for inhalation of contaminants, air monitoring will be completed using a PID and a combination CGI/oxygen meter. In addition, a chemical-specific air monitor, if necessary, will be used in the breathing zone of site personnel. Vapor concentrations will be documented at each sample location. If during the vapor survey, readings are above background in the breathing zone of site personnel, workers will evacuate the area in an upwind direction. If air concentrations in the worker breathing zone continue to exceed background levels, the level of PPE will be based on the chemicals associated with the site and the action levels specified in Section 7.0. Air monitoring at the sample location will be conducted at 15-minute intervals. Air monitoring results will be documented in field logbooks and sampling reports.

When vapor readings do not exceed action levels, Level D PPE will be used. For the sampling of water matrices, Level D will consist of splash protection, steel-toed rubber boots, nitrile gloves, and safety glasses. Leather boots will be permitted with outer disposable boots. For the sampling of sediment and soil, Level D will consist of coveralls, steel-toed boots, and nitrile gloves.

## **4.0 SITE WORKER TRAINING**

Consistent with the OSHA 29 CFR 1910.120 regulation covering Hazardous Waste Operations and Emergency Response, all site personnel must be appropriately trained. At a minimum, all personnel are required to be knowledgeable of the hazards onsite, the provisions of this HSP, and the responsible health and safety personnel.

### **4.1 PREASSIGNMENT TRAINING**

Before arrival onsite, each employer will be responsible for certifying that field personnel meet the requirements of preassignment training. Consistent with OSHA 29 CFR 1910.120 paragraph (e)(3), each employer will be able to provide a document certifying the dates of 40 hours of health and safety training and eight hours of annual refresher training for each team member (Appendix G).

### **4.2 SUPERVISOR TRAINING**

Consistent with OSHA 29 CFR 1910.120 paragraphs (e)(8), individuals designated as site supervisors and the SHSC require an additional eight hours of training.

### **4.3 FIRST AID AND CARDIOPULMONARY RESUSCITATION TRAINING**

At least one site employee per team, including the SHSC, must have currently certified first aid, cardiopulmonary resuscitation (CPR), and bloodborne pathogens (Appendix H), training consistent with the requirements of OSHA and the American Red Cross Association.

### **4.4 SITE SAFETY MEETINGS**

Site safety meetings will be conducted by the SHSC when field personnel are initially assigned to this project, before field personnel begin work at specific sites, when there are modifications to the HSP, and when additional personnel begin fieldwork. Meetings will be attended by all personnel involved in field activities. Additionally, a daily site safety meeting will be held before daily field activities begin. All field personnel will attend and the meeting will be documented in the site logbook. In addition, a safety meeting form (Appendix I) will be completed.

The site safety meeting agenda will include the following activities:

- description of the assigned tasks and potential hazards;
- coordination of site activities;
- identification of methods and precautions to prevent injuries;
- discussion of emergency planning;
- review of the HSP and subsequent modifications to the HSP;
- review of procedures for radio contact between field teams;
- firearm safety issues;

- input from field personnel on health and safety issues pertaining to site activities; and
- collection of the attendees' signatures, acknowledging receipt and understanding of the HSP and their agreement to comply.

All site training will be documented and retained in project files.

## 5.0 PERSONNEL PROTECTION

Personnel will wear protective equipment when field activities involve known or suspected atmospheric contamination; when vapors, gases, particulates, or splashes may be generated by site activities; or when direct contact of contaminants with skin may occur. Full-face, air-purifying, and supplied-air respirators protect the lungs, gastrointestinal tract, and eyes against airborne toxicants. Chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals.

The primary level of protection necessary for field activities at all sites will be Level D. If sustained airborne organic vapor concentrations in the breathing zone exceed background, site personnel will upgrade the level of protection to Level C or Level B PPE in the Exclusion Zone. The SHSC will decide whether upgrading the level of PPE is appropriate. The SHSC will then provide appropriate documentation noting all pertinent PPE changes to the PHSM.

### 5.1 LEVEL D PROTECTION

The following equipment will be considered Level D PPE:

- coveralls or work clothes;
- hunters orange safety vest;
- boots (leather or chemical-resistant polyvinyl chloride [PVC]) with a steel toe and shank for all tasks;
- outer latex disposable boots (optional);
- work gloves (optional);
- safety glasses or chemical splash goggles, when necessary, as determined by the SHSC;
- hard hat (when appropriate);
- hearing protection (when appropriate); and
- two-way radio communications (intrinsically safe).

Meeting the following criteria enables use of Level D protection:

- no hazardous air pollutants are measured; and
- work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

Level D protection is primarily a work uniform and will be worn only in areas where there is no potential for exposure to toxic substances.

## 5.2 LEVEL C PROTECTION

The following equipment will be considered Level C PPE:

- full-face, air-purifying, cartridge-equipped respirator (Mine Safety and Health Administration [MSHA]/NIOSH-approved) with organic vapor/high-efficiency particulate air (HEPA) cartridges (in some locations acid gas protection may also be required);
- chemical-resistant clothing (Tyvek or Saranex coveralls depending on need for splash protection);
- hunters orange safety vest;
- nitrile outer gloves;
- disposable nitrile inner gloves;
- PVC boots (chemical-resistant) with a steel toe and shank;
- latex booties (outer) that are chemical-resistant and disposable (optional);
- hard hat (if needed);
- hearing protection (as required); and
- two-way radio communications (intrinsically safe).

Level C protection will be used when the following applies:

- measured air concentrations of identified substances are reduced by the respirator to at or below the substance's PEL and the concentrations are within the service limit of the chemical cartridges;
- atmospheric contaminant concentrations do not exceed IDLH levels;
- atmospheric contaminants, liquid splashes, or other direct contact do not impact the small area of skin left unprotected by chemical resistant clothing;
- job functions are determined not to require self-contained breathing apparatus;
- air quality is continuously monitored to detect concentration changes that would necessitate a higher level of respiratory protection.

The main selection criterion for Level C is that conditions permit wearing air-purifying devices. The air-purifying device must be a full-face mask (MSHA/NIOSH-approved) equipped with organic vapor/HEPA cartridges.

In addition, use of a full-face air-purifying mask is approved only if the following applies:

- substances are identified and their concentrations measured;

- substances have adequate warning and adsorption properties (Table 5-1 lists common chemicals for which a cartridge respirator is not appropriate);
- individual passes a qualitative fit test for the mask; and
- appropriate cartridge is used, and its service limit concentration is not exceeded.

### 5.3 SAFETY EQUIPMENT AND MATERIALS

Additional safety equipment and materials that will be onsite include the following:

- first-aid kit;
- portable eyewash;
- fire extinguisher(s), 20-pound A:B:C;
- wind direction indicator; and
- electrolyte fluids.

### 5.4 WORK LIMITATIONS

The following work limitations will be observed during the performance of activities at each site:

- No eating, drinking, or smoking will occur onsite. (Fluid intake is allowed in Support Zone areas.)
- No contact lenses are to be worn onsite when the potential for respirator use exists.
- Facial hair must not interfere with the fit of the respirator.
- Site activities will not be conducted without adequate lighting.
- Site activities will not be conducted during inclement weather.

### 5.5 COMMUNICATION

Verbal communication at the sites may be impeded by background noise from heavy equipment and the use of PPE. Two-way radios will be used onsite when communication is necessary between work zones. Hand signals used between personnel within the Exclusion Zone will be reviewed during site safety meetings conducted before starting work at the individual sites. Hand signals used in the event of an emergency where audible communication is not possible include the following:

- **clutching throat:** personal distress; and
- **arm waving in a circle over the head:** if given in the Exclusion Zone: need assistance; if given in the Support Zone: evacuate.



**TABLE 5-1**  
**CHEMICAL CARTRIDGE FAILURE GUIDE**

Acetic acid	3-Heptanone
Acetone	Hexone
Acrolein	Hydrogen cyanide
Acrylonitrile	Hydrogen fluoride
Allyl chloride	Hydrogen selenide
sec-Amyl acetate	Hydrogen sulfide
Aniline	Mesityl oxide
Arsine	Methanol
Benzyl chloride	Methyl acetate
Bromine	Methyl bromide
Butyl Acetate	5-Methyl, 3-heptone
sec-Butyl acetate	Methyl iodide
tert-Butyl acetate	Methyl parathion
Butyl ketone	Methylene chloride
Camphor	Naphtha
Carbon monoxide	Nickel carbonyl
Carbon tetrachloride	p-Nitroaniline
Chloroacetaldehyde	Nitrobenzene
Chloroacetophenone	Nitrogen oxide
Chlorobenzene	Nitroglycerin
Chlorohexanone	Nitromethane
Diazomethane	Ozone
Dichloroethane	Perchloroethylene
1,2-Dichloroethane	Petroleum distillates
cis- and trans-1,2-Dichloroethylene	Phenol
Dichloromethane	Phosgene
Diethylamine	Phosphine
Difluorodibromomethane	Phosphorus trichloride
Diphenylbenzenes	Stibine
Epichlorohydrin	Stoddard solvent
Ethanol	Sulfur chloride
Ethyl acrylate	Terphenyls: ortho-, meta-, and para-
Ethyl amine	Toluene diisocyanate
Ethyl formate	Triphenyls
Formaldehyde	Turpentine
Furfural	Vinyl chloride



External communication between onsite and offsite personnel will be conducted through the use of telephones located at facilities in proximity to the sites. The exact locations of the telephones and their numbers will be obtained before the site safety meeting and will be given to all site personnel.

## **5.6 SITE VISITORS**

Access to the site by visitors will be restricted as follows:

- All personnel must sign in at the site command post located at the site boundary.
- All site visitors must be cleared at the command post by the SHSC, or designee, before obtaining access to the Support Zone.
- Site visitors entering the Exclusion Zone will be strictly limited. The SHSC must approve entry and the visitor must demonstrate medical and training clearance to enter the Exclusion Zone and then must be given site-specific training. Site-specific training for visitors will be documented by the SHSC.
- All site visitor access must be clearly documented and visitors must comply with all provisions of the site-specific HSP.

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## **6.0 MEDICAL SURVEILLANCE REQUIREMENTS**

Medical monitoring programs are designed to track the physical condition of employees on a regular basis, as well as survey preemployment or baseline conditions before potential exposures. The medical surveillance program is a part of each employer's health and safety program.

### **6.1 BASELINE OR PREASSIGNMENT MONITORING**

Before being assigned to a hazardous or potentially hazardous activity involving exposure to toxic materials, each employee must receive a preassignment or baseline physical examination. The content of the examination is to be determined by the employers' medical consultant. As suggested by NIOSH/OSHA/U.S. Coast Guard/U.S. Environmental Protection Agency (EPA) *Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH et al. 1985), the minimum medical monitoring requirements for work at Indian Mountain LRRS are as follows:

- complete medical and work histories;
- physical examination;
- pulmonary function test, forced vital capacity and forced expiratory volume;
- chest X-ray;
- electrocardiogram;
- eye examination and visual acuity;
- audiometry;
- urinalysis; and
- blood chemistry, including hematology and serum analyses.

At present, no additional testing for specific contaminant health effects is required.

The preassignment physical examination should categorize employees as fit for duty and able to wear respiratory protection.

### **6.2 ANNUAL MONITORING**

In addition to the baseline physical examination, all employees are required to obtain an annual physical exam, unless the advising physician believes a shorter interval is appropriate. The employers' medical consultant will prescribe an adequate physical examination that meets OSHA 29 CFR 1910.120 requirements. The preassignment medical monitoring criteria outlined previously may be applicable.

All personnel working in contaminated or potentially contaminated areas at Indian Mountain LRRS will verify that their medical monitoring is current (within 12 months). Jacobs' subcontractors will have documentation onsite specifying all employees are fit for duty. Each certificate will be signed by an attending physician.

### **6.3 EXIT PHYSICAL**

Enrollment in the medical monitoring program will end when the employee terminates the program or the company. At that time, an exit examination for the employee is required. Each employee will undergo an exit physical examination unless written documentation waiving this requirement is provided.

### **6.4 EXPOSURE/INJURY/MEDICAL SUPPORT**

As follow-up to an injury or a possible exposure above an established exposure limit, all employees are entitled and encouraged to seek medical attention and physical testing. Depending on the type of exposure, it is critical to perform follow-up testing within 24 to 48 hours. It will be up to the employers' medical consultant to advise the type of test or tests required to accurately monitor for exposure effects.

### **6.5 RECORD KEEPING**

For each person involved with this project, including subcontractor personnel, copies of pertinent records required by 29 CFR 1910.120 will be maintained onsite by the SHSC. These forms include medical clearance, CPR and first aid documentation, site health and safety briefings, accident reporting forms, and current hazardous waste training.

## 7.0 AIR MONITORING REQUIREMENTS

Airborne concentrations of volatile and semivolatile hydrocarbons and flammable/explosive environments will be measured using FID, PID, CGI, and oxygen meter direct reading instruments (DRI). Colorimetric detector tubes will be used for specific chemicals of concern. For chemicals that can be detected with a PID or FID, colorimetric tubes will be used to characterize specific contaminant concentrations. As directed by the SHSC, these instruments will be used to monitor entry into exclusion zones, at varying site perimeters, and at specific work locations. The type of DRI and the application will depend on the contaminants of concern, site characteristics, and specific tasks being completed.

Most exposure monitoring will be conducted using DRIs in the breathing zone of the workers. Initial background readings will be obtained before activities begin. Readings will be taken every 15 minutes for activities that are not intrusive (e.g., resource surveys, surface geophysics, etc.). Intrusive activities will require continuous monitoring to ensure the action level is not exceeded or to identify additional measures to be taken. All monitoring results will be recorded in a logbook. Monitoring, calibration, and maintenance of instruments will be responsibility of the SHSC or a designee. The results of such operations will be included in the SHSC's logbook documentation and calibration log. The instruments to be used will be selected based on the contaminants of concern associated with an area. All monitoring equipment will be calibrated before each use in accordance with the manufacturer's instructions. Records of daily calibrations will be kept in a logbook at the site.

Organic Vapor Monitoring. A FID or PID will be used to measure airborne levels of organic vapors during the performance of all activities at each of the sites to determine the proper level of respiratory protection. For the PID, a 10.2 electron volt (eV) probe will be used for general work. If FID or PID measurements confirm the presence of unidentified organic vapors at concentrations exceeding 5 parts per million (ppm) above background, or an odor is detected, field personnel will evacuate the immediate area to an upwind location. If concentrations diminish to less than 5 ppm above background, work will continue. It should be noted that if airborne concentrations are above background, and benzene or vinyl chloride are contaminants of concern, a colorimetric detector tube specific to these compounds will be used.

The following unidentified organic vapor action levels for the selection of PPE have been established when using a FID or PID.

---

Measured Level (Above Background)	Action
< 5 ppm	Level D
≥ 5 ppm < 30 ppm	Level C
≥ 30 ppm	Level B or withdraw from area

---

If benzene is a suspected contaminant in an area being investigated, the following action levels specific to these compounds will be used.

---

**BENZENE (Colorimetric Detector Tube)**

Measured Level (Above Background)	Action
$\leq 1$ ppm	Level D
$> 1$ ppm $\leq 50$ ppm	Level C or withdraw from area
$> 50$ ppm	Level B or withdraw from area

---

Colorimetric Tubes. Direct-reading colorimetric indicator tubes will be used to identify chemicals of concern when elevated PID or FID readings are obtained. Colorimetric tubes will also be used when a suspected chemical compound potentially exists within the area being assessed. The principle of colorimetric tubes is that the compound of concern reacts with the indicator chemical in the tube to produce a stain whose length of color change is proportional to the compound's concentration. Action levels are based on the PELs and physical and chemical properties of the chemical of concern.

Combustible Atmosphere Monitoring. Periodic monitoring will be performed with a CGI during drilling-related activities. Combustible atmospheres are not anticipated in the ambient atmosphere. During drilling-related activities, the following action levels for combustible gases will be used.

---

Measured Level	Action
$< 10$ percent (%) LEL	Continue investigation.
10% - 20% LEL	Continue onsite monitoring with extreme caution as higher levels are encountered.
$> 20\%$ LEL	Explosion hazard-withdraw from areas immediately. Return to work as instructed by SHSC.

Note: A CGI/oxygen meter will be used with a PID or FID when conducting operations at Indian Mountain LRRS.

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Oxygen Level Monitoring. In addition to combustible gas, oxygen levels will be monitored during drilling-related activities, because at low oxygen levels, CGIs will give erroneously low readings. Under such conditions, site personnel may falsely assume that the atmosphere is free of flammable vapors when, in fact, it is not. By taking oxygen readings concurrently with combustible gas readings, this situation may be avoided. The following criteria for oxygen level monitoring will be used.

---

**Measured Level****Action**

&lt; 19.5%

If in breathing zone, monitor wearing self-contained breathing apparatus. CGI readings not valid.

&gt; 23.5%

Fire hazard. Discontinue monitoring.

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It is not anticipated that site personnel will work in oxygen-deficient or enriched atmospheres, though the potential for an oxygen-deficient atmosphere may exist within boreholes, monitoring wells, etc.



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## **8.0 SITE CONTROL**

Indian Mountain LRRS is a remote military installation. Personnel must check in on arrival and receive authorization to proceed before accessing the installation.

Before starting work at individual sites, safety meetings will be conducted to discuss health and safety issues including natural hazards and the necessary protective equipment required for site activities. These meetings will be conducted by the SHSC or Field Supervisor and documented on the Safety Meeting Form (Appendix I).

Decontamination areas for personnel and equipment will be established upwind of the site locations. The decontamination areas will be located a sufficient distance from the activities to remain free of splashing water, visible airborne dust, or elevated PID or FID readings resulting from operations onsite.

A site must be controlled to reduce the possibility of contaminant exposure and contaminant transport by personnel or equipment from the site. This type of exposure or translocation can be reduced or eliminated in a number of ways, including the following:

- setting up security and physical barriers to exclude unnecessary personnel from the general area;
- minimizing the number of personnel and equipment onsite consistent with effective operations;
- establishing work zones within the site;
- establishing control points to regulate access to work areas or zones;
- conducting operations in a manner to reduce the exposure of personnel and equipment and to eliminate the potential for airborne dispersion; and
- implementing appropriate decontamination procedures referenced in Section 9.0.

### **8.1 WORK ZONES**

Movement of personnel and equipment between work zones and onto or off the site will be limited to controlled access points. Therefore, contamination will be contained within certain relatively small areas on the sites and the potential for translocation minimized. The following three contiguous zones will be used:

- Zone 1: Exclusion Zone
- Zone 2: Contamination Reduction Zone
- Zone 3: Support Zone

### **8.1.1 Zone 1: Exclusion Zone**

The Exclusion Zone is the innermost of three concentric areas and is the zone where contamination is known to or could occur. All personnel entering the Exclusion Zone will wear the prescribed level of PPE for the specific site.

An entry and exit check point will be established at the periphery of the Exclusion Zone to regulate the flow of personnel and equipment into and out of the zone and to verify that established entry and exit procedures are followed. All personnel, equipment, and materials exiting the Exclusion Zone will be considered contaminated and will undergo decontamination procedures before exiting the site.

The outer boundary of Zone 1 is the Hotline. It will be established by visually surveying the immediate area and determining where the hazardous substances involved are located, where any drainage, leachate, or spilled material is located, and whether any discolorations are visible. Additional factors that will be considered include (1) the distances needed to prevent fire or an explosion from affecting personnel outside the zone, (2) the physical area necessary to conduct site operations, and (3) the potential for contaminants to be blown from the area. Once the Hotline is determined, it will be well marked. During subsequent site operations, the boundary may be modified and adjusted as additional information becomes available.

### **8.1.2 Zone 2: Contamination Reduction Zone**

The Contamination Reduction Zone provides a transition area between contaminated and clean areas. This zone will serve as the following:

- a buffer to further minimize the probability of the clean zone being contaminated or affected by other existing hazards;
- an area for decontamination of equipment, supplies, samples, and personnel;
- an emergency first-aid station for injured personnel;
- an equipment (e.g., air tank, personal protective clothing, sampling equipment, and tools) resupply station;
- an area used for packaging and preparing samples for onsite or offsite laboratories; and
- a temporary rest area for personnel.

It provides additional insurance that the physical transfer of contaminated substances by personnel, equipment, or air is limited by distance between Exclusion and Support zones, decontamination, air dilution, and zone restriction.

### **8.1.3 Zone 3: Support Zone**

The Support Zone is considered an uncontaminated or clean zone; therefore, potentially contaminated personal protective clothing, equipment, and samples are not permitted in this area. Normal work clothes are appropriate attire within the zone. The Support Zone will serve as the following:

- command post;
- medical station;
- equipment and supply center; and
- administrative center.

## **8.2 SANITATION**

Existing sanitary facilities are available only at the Lower Camp and Upper Camp facilities.

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## **9.0 DECONTAMINATION PROCEDURES**

The SHSC is responsible for ensuring that all personnel and equipment exiting the site are properly decontaminated according to the procedures outlined below. Documentation of decontamination must be made in the field log notebook that will become part of the permanent project file.

### **9.1 PERSONNEL**

Decontamination procedures will be followed by all personnel exiting the Exclusion Zone. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site before decontamination. Generalized decontamination procedures for Levels B, C, and D PPE are provided below. The SHSC may simplify the procedures in the field, if minimal contamination has occurred to specific protective equipment.

Respirators will be decontaminated daily. The facepieces will be disassembled, the cartridges disposed of, and all other parts placed in a cleansing solution. After an appropriate time in the solution, the parts will be removed and rinsed with tap water. Facepieces will be air-dried before being placed in sanitized bags. All personnel will inspect their respirator on a daily basis to ensure proper operation.

Decontamination procedures for Level D protective equipment will be modified from the procedures above to include removal of loose debris, washing and rinsing of disposable garments, and discarding of disposable materials. Subsequent to personal decontamination, all personnel (regardless of level of protection worn) will shower as soon as possible after leaving the site.

Disposable items (e.g., Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis (minimum). Decontamination solutions will be changed daily (or as conditions require). Respirator cartridges will be changed at least on a daily basis, or more frequently if breakthrough is obtained, or as directed by the SHSC.

A generic decontamination action sequence for Level C is presented in Table 9-1. A generic equipment list is presented in Table 9-2. Figure 9-1 shows a typical decontamination layout. Figure 9-2 illustrates a minimum decontamination layout for Level C.

### **9.2 SAMPLING EQUIPMENT**

Small instruments and equipment will be protected from contamination to the extent possible by draping, masking, or otherwise covering as much of the unit as possible with plastic, without hindering its operation. As necessary, air monitoring equipment will be placed in clear plastic bags that enable reading of the scales and operation of the knobs. The sensors can be partially wrapped, keeping the sensor tip and discharge port clear.

Contaminated equipment will be taken from the Contamination Reduction Zone and disposed of in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be placed in a clean plastic tub, wiped with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation.

**TABLE 9-1  
LEVEL C DECONTAMINATION**

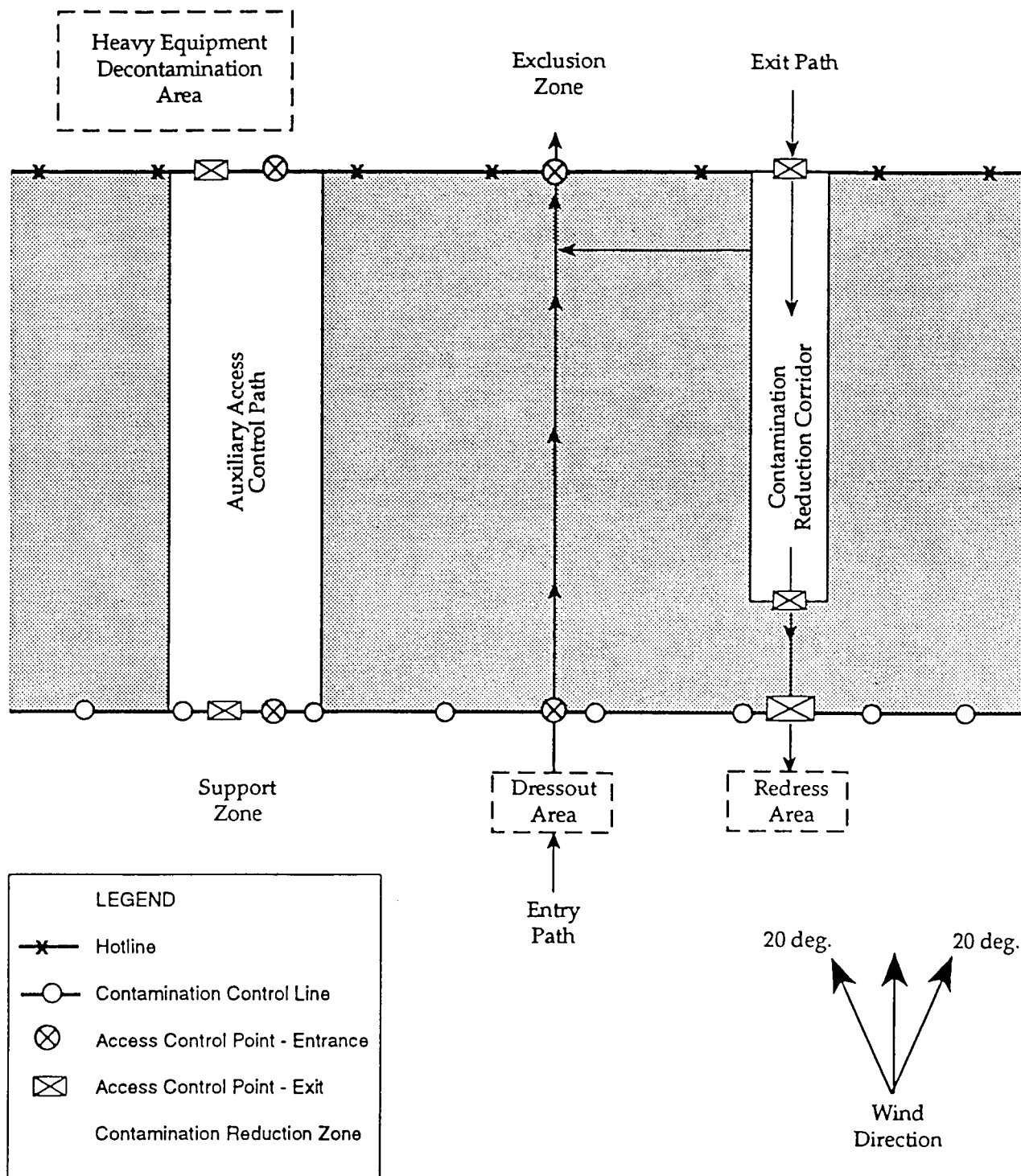
Station	Action	Comment
1	Segregated equipment drop	
2	Boot cover and glove wash	
3	Boot cover and glove rinse	Repeat as many times as necessary.
4	Tape removal from wrists/ ankles	
5	Boot cover removal	
6	Outer glove removal	
7	Suit/ safety boot wash	
8	Suit/ boot/ glove rinse	Repeat as many times as necessary.
9	Cartridge or facepiece change	If worker leaves Exclusion Zone to change cartridge (or facepiece), this is the last step in the decontamination procedure.
10	Safety boot removal	
11	Splash suit removal	
12	Inner glove wash	
13	Inner glove rinse	Repeat as many times as necessary.
14	Facepiece removal	Avoid touching face with fingers.
15	Inner glove removal	

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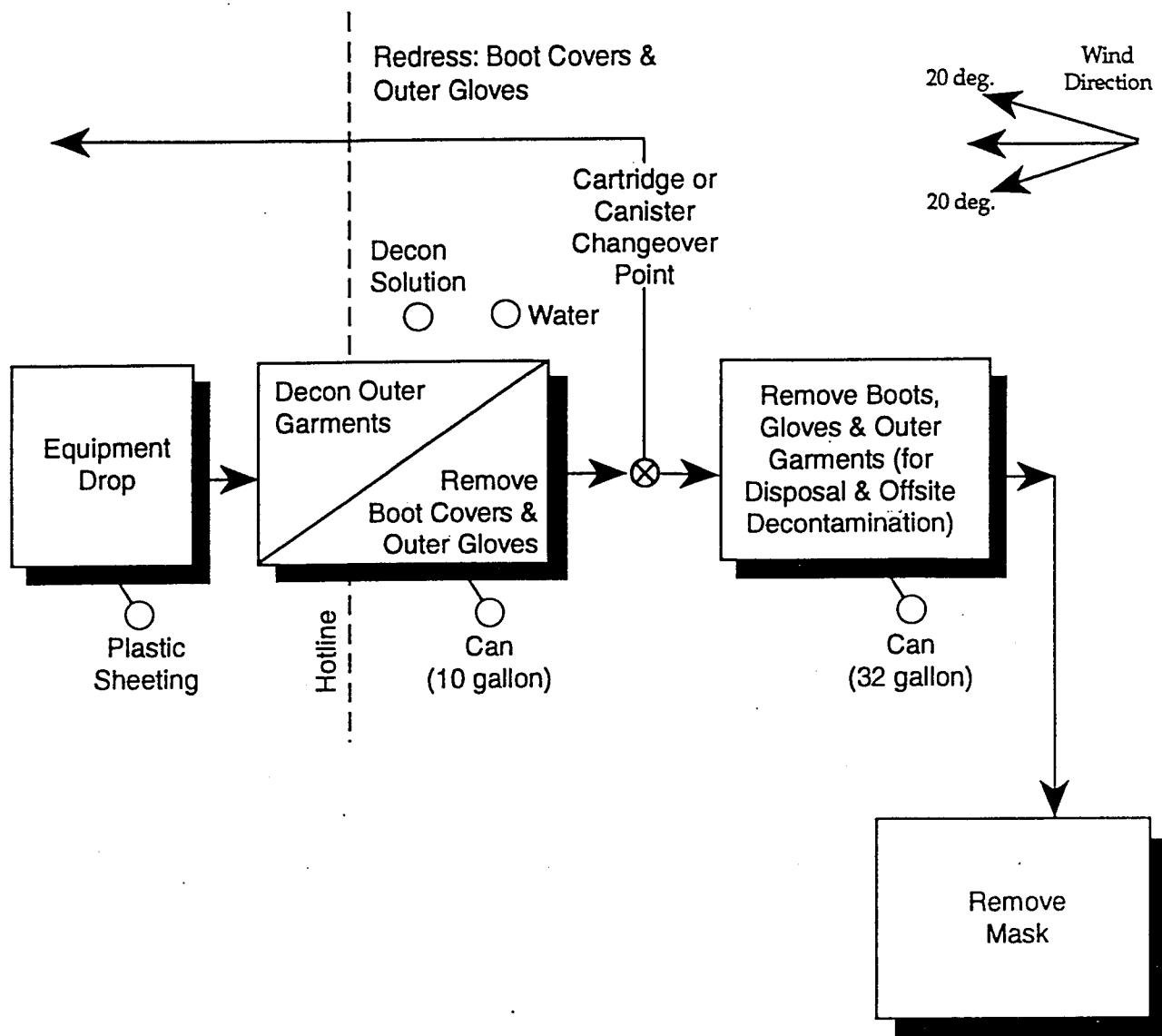
**TABLE 9-2**  
**PERSONNEL DECONTAMINATION EQUIPMENT LIST**

- |           |  |
|-----------|--|
| Station 1 | a. Various sized containers<br>b. Plastic liners<br>c. Plastic drop clothes  |
| Station 2 | a. Containers (20 to 30 gallons)<br>b. Decon solution<br>c. Rinse water<br>d. Two to three Long-handled, soft-bristled scrub brushes |
| Station 3 | a. Containers (20 to 30 gallons)<br>b. Plastic liners<br>c. Bench or stools  |
| Station 4 | a. Air tanks, facepieces, and cartridges depending on level of protection<br>b. Tape<br>c. Boot covers<br>d. Gloves                  |
| Station 5 | a. Containers (20 to 30 gallons)<br>b. Plastic liners<br>c. Bench or stools  |
| Station 6 | a. Plastic sheets<br>b. Basin or bucket<br>c. Soap and towels<br>d. Bench or stools  |
| Station 7 | a. Water<br>b. Soap<br>c. Tables<br>d. Wash basin or bucket  |
-





**FIGURE 9-1**  
**Typical Contamination**  
**Reduction Zone Layout**  
**Indian Mountain Long Range Radar Station**



**FIGURE 9-2**  
**Typical Level C**  
**Decontamination Minimum Layout**  
**Indian Mountain Long Range Radar Station**

### **9.3 HEAVY EQUIPMENT**

Heavy equipment (e.g., drilling rig) will be decontaminated using high-pressure steam cleaning.

### **9.4 DISPOSAL OF MATERIALS GENERATED ONSITE**

Investigation-derived waste (including PPE, decontamination fluid, etc.) will be contained, labeled, and placed in a secure area by Jacobs before final disposition onsite or offsite, as directed by representatives of the Station and/or project management.

## **10.0 CONFINED SPACE ENTRY PROCEDURES**

No confined space entry is anticipated in support of field activities conducted at Indian Mountain LRRS. If confined space entry is required, the HSP will be revised to include the Jacobs confined space entry SOP.

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## 11.0 EMERGENCY RESPONSE PLAN

### 11.1 SITE EMERGENCIES

In the event of injury, accident, or other emergency, all personnel are responsible for following the provisions of this HSP. A copy of the HSP will accompany site personnel when in the field. Emergency contact numbers will be conspicuously posted onsite to allow easy access to all personnel.

In the event of a site emergency, the following are the emergency contact telephone numbers:

#### Information and Response Organizations:

Alaska Regional Hospital Medi-Vac (24 hours)	(907) 258-3822
CHEMTREC (24 hours)	1-800-424-9300
Poison Control Center (24 hours)	1-800-458-5842
TSCA Hotline (8:30 AM to 5:00 PM eastern time)	202-554-1404
Centers for Disease Control (24 hours)	404-452-4100 or 404-329-2888
National Response Center (24 hours)	1-800-424-8802
Pesticide Information Center (24 hours)	1-800-845-7633
EPA Environmental Response Team (24 hours)	201-321-6660
Resource Conservation and Recovery Act Hotline (8:30 AM to 7:30 PM eastern time)	1-800-424-9346

#### Jacobs Project Personnel:

Health and Safety Manager	T. Briggs (303) 595-8855
Project Manager	L. Schuetter (303) 595-8855
Site Health and Safety Coordinator	J. Russ (onsite)

#### Emergency Medical Consultation:

Dr. Mitchell Zavon (24 hours)	(513) 421-3063
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### 11.2 PRE-EMERGENCY PLANNING

The SHSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency service providers as appropriate. These tasks include the following:

- Evaluate and document capabilities of Station emergency response teams, if any.
- Verify local emergency contacts, evacuation routes, and assembly points.
- Notify appropriate emergency responders listed above, before site mobilization.

- Post the site map marked with locations of emergency equipment and supplies.
- Place a copy of this HSP in each vehicle and keep keys in ignition during field activities in case of a bear hazard or other emergency.
- Inventory and check site emergency equipment and supplies.
- Establish emergency signals, evacuation routes, and onsite and offsite assembly points.
- Review emergency procedures for personnel injury (Subsection 11.3).
- Review names of onsite personnel trained in first aid and CPR.
- Review emergency response and post-emergency notification procedures.
- Rehearse the emergency response plan, before site activities.
- Show field team members where emergency response equipment is located in the support area.
- Brief all workers on the emergency response plan.

### **11.3 EMERGENCY MEDICAL TREATMENT**

There are no medical facilities at Indian Mountain LRRS. If required, the SHSC will contact the medi-vac service listed in Section 11.1. The SHSC is to assume responsibility during a medical emergency until the air ambulance arrives and the injured person is in the care of a trained medical professional. The SHSC will take the following action:

- prevent further injury;
- initiate first aid and CPR;
- call emergency contacts listed in Section 11.1, as required;
- determine if decontamination will make injury worse and seek medical treatment immediately;
- make certain injured person is accompanied to emergency room by at least one field team member of the same employer; and
- provide hospital emergency personnel with a copy of the HSP.

If the cause of the injury does not affect the performance of site personnel, operations may continue with the appropriate onsite field personnel initiating the appropriate first aid and necessary follow-up. If the injury increases the risk to others, all field personnel will move to a designated location until further instructions. Activities onsite will cease until the added risk is removed or minimized.

#### 11.4 OTHER EMERGENCIES

**Fire/Explosion:** Upon notification of a fire or explosion onsite, all site personnel will assemble at the decontamination line. All site personnel will be moved a safe distance from the involved area.

**Personal Protective Equipment Failure:** In the event that a site worker experiences a failure or alteration of protective equipment affecting the protection factor, that person and a buddy will leave the Exclusion Zone immediately. Reentry will not be permitted until the equipment has been repaired or replaced.

**Other Equipment Failure:** If any other equipment onsite fails to operate properly, the SHSC will be notified and will determine the effect of the failure on continuing operations onsite. If the failure affects the safety of personnel or prevents completion of Work Plan tasks, all personnel will leave the Exclusion Zone until the situation is evaluated and appropriate actions are taken.

#### 11.5 NATURAL HAZARDS

Indian Mountain LRRS is potentially susceptible to weather severe enough to restrict outdoor activities. Possible health and safety hazards may occur as a result of storm activity. Weather conditions will be checked before any outdoor field activities are initiated and field teams will be briefed.

#### 11.6 BEAR HAZARDS

Indian Mountain LRRS is in a remote location where bear populations present a potential hazard. The area surrounding Indian Mountain has been identified as a denning area for the brown (grizzly) bear. Large numbers of black bears also inhabit the area around Indian Mountain LRRS. The following information will be distributed to each field team member before their arrival at Indian Mountain LRRS. A health and safety orientation and informational packet specific to bears will be presented upon arrival at Indian Mountain LRRS. State of Alaska, Division of Fish and Wildlife, Guidelines for Bear Kills will be included in the orientation and are presented in Appendix J.

##### BLACK BEAR

**Identification:** The black bear is the smallest and most abundant of the bear species in Alaska. They are about five to six feet long and stand two to three feet high at the shoulders. Black bears range from 200 to 300 pounds. While they are commonly black, other color phases include brown (cinnamon), and rarely gray-blue and white. Muzzles are always brown. Black bears can be distinguished from brown bears by (1) their head shape (a black bear's nose is straight while a brown bear's nose is dished; (2) their claws (black bear's claws are smaller and curved while a brown bear's claws are larger and straight); (3) their body shape (when standing on all four legs, a black bear's rump appears to be higher than its shoulder while a brown bear's shoulders are higher than its rump); and (4) by their ears (a black bear's ears are more prominent than a brown bear's ears).

**Range:** Black bears live throughout Alaska except on Kodiak Island, the Alaska Peninsula, and the extreme northern and western portions of the state.



Habitat: Black bears can occupy a wide range of habitats, but they seem to be most common in forested areas. Black bears are not uncommon among human settlements (Alaska Department of Fish and Game [ADF&G], undated).

### BROWN BEAR

Identification: Brown bears and grizzly bears are the same species. They can grow to be over eight feet long and stand five feet high at the shoulders. Weights are typically 600 to 800 pounds, but can reach 1,500 pounds. Colors range from blonde to dark brown. Coastal bears (referred to brown bears) are the largest land carnivores and are usually medium to dark brown. Interior bears (referred to as grizzly bears) are usually smaller and usually have light tips on their hair, giving them a grizzled appearance. A brown bear's muzzle is the same color as its body. Cubs frequently have a white collar around their neck and shoulders. The dish shaped face and large shoulder humps are distinguished features of the brown bear.

Range: Brown bears live throughout Alaska, except for the southern panhandle of southeastern Alaska and on the Aleutian and some other islands. Biologists estimate there are 30,000 to 45,000 brown bears in the state. Highest densities occur on Admiralty Island, Kodiak Island, and the Alaska Peninsula.

Habitat: Brown bears use virtually every type of habitat in the state. Although they are less common around human settlements than black bears, brown bears can live in proximity to people (ADF&G undated).

In order to facilitate the safety of field personnel in remote or unprotected locations, bear guards will be present with each field team during all field activities. The primary objective of the bear guards is to provide a working environment for field personnel safe from bears through a policy of deterrence. All field team members will wear hunters orange safety vests during all field activities that require a bear guard. Hunters orange vests will be required for these field activities as part of Level D and Level C PPE.

Two experienced field team members will be designated specifically with the purpose of guarding any and all field team members working outside of Indian Mountain LRRS buildings against bears. Only personnel trained with hunter safety certificate and experienced in the handling and shooting of firearms will be allowed to carry weapons in the field. Each bear guard will carry an adequate firearm and be appropriately armed with both bear deterrent ammunition (i.e., PVC bullets, bird shot, etc.) and ammunition capable of killing a bear if necessary. The minimum required firearm is a 12-gauge pump shotgun loaded with 3-inch magnum slug ammunition. All measures will taken to deter a bear. If deterrence fails and there is an immediate threat to human life, the bear will be killed. Each bear guard will wear a hunters orange safety vest at all times.

In the unlikely event of a bear kill, all pertinent authorities and the Project Manager will be notified. A Defense of Life or Property/Non-Hunting Bear Kill Reporting Form required by the Alaska Department of Fish and Game Division of Wildlife Conservation (included in Appendix K), will be completed with a detailed description of the circumstances surrounding the bear kill. Bears shot and killed in self-defense must be skinned and the head and hide surrendered to the state.

## **11.7 RABIES**

The area surrounding Indian Mountain LRRS is inhabited by various animals, some of which may be rabid. Rabies is an extremely serious illness transmitted to people through the saliva of diseased animals. In northern Alaska, the arctic fox is the largest single reservoir of rabies in the state. Over 75 percent of the foxes tested for rabies in the last ten years have been rabid. Foxes are normally shy and will avoid human contact. Animals with rabies act in unusual ways. For example, a wild animal with rabies might not run away from people. A rabid animal sometimes drools. The animal may be partly paralyzed. If a fox or other animal acts abnormally and an attack appears imminent, the animal should be shot and killed and the incident reported.

Personnel will stay away from animals at Indian Mountain LRRS. Personnel will not feed or pet animals while at Indian Mountain LRRS. Personnel will not touch or handle dead animals. A person bitten by any animal must seek medical attention immediately.

## **11.8 INSECTS AND BITES**

Due to the remote location and proximity of Indian Mountain LRRS to densely vegetated areas and river ways, a significant population of black flies, horseflies, and mosquitos is present. Due to the numbers of insects, field activities conducted without proper protection can result in a large number of insect bites. Proper protection includes mosquito netting (neck and face), gloves, tight-fitting clothing, and various insect repellents. (Repellents containing 100 percent DEET are recommended.) Repellents may cause irritation, so care should be taken to keep repellents out of eyes, ears, nose, and mouth. Repellents will not be used while collecting samples because of the possibility of contaminating the samples. If insect bites occur, analgesic-corticosteroid lotion may be used, alone or in combination with ice, to relieve itching and discomfort.

## **11.9 POISONOUS PLANTS**

Poisonous plants have not been identified at Indian Mountain LRRS; however, these plants are often found in low-lying areas, wetlands, ditches, and creeks. Signs and symptoms of exposure to poisonous plants include redness, swelling, and sometimes intense itching. Other plants not considered poisonous pose physical hazards from sharp spines or pointed barbs such as "devils club" plants. Care should be taken to avoid encounters with such plants. Proper clothing, eye protection, and gloves should be worn at all times to reduce contact with plants posing a hazard.

## **11.10 EVACUATION**

If evacuation is deemed necessary for any of the above-mentioned hazards, the steps below should be followed:

- Personnel are to leave the sampling location and go to a designated assembly point when the emergency signal for evacuation is heard.
- If the emergency situation is of concern to Station personnel, notify the Communication Center of the emergency situation.

- If appropriate, the SHSC and a buddy are to remain at or near the sampling location after it has been evacuated, to assist local responders and advise them of the nature and location of the incident.
- The SHSC, or designee, will account for field team members at the assembly point.
- The SHSC will complete an incident report, as soon as possible after occurrence.

#### **11.11 EMERGENCY RESPONSE FOLLOW-UP**

In the event of a serious or fatal accident or injury, an immediate telephone report will be completed by the SHSC to the PHSM, outlining all details of the accident or injury and action(s) taken.

All incidents involving personal injury or exposure to potentially hazardous materials during any activity will be documented and reported to the PHSM using the Employee Exposure/Injury Report (Appendix L). The report will include the following:

- chronological history of the incident;
- facts concerning the incident and when they became available;
- titles and names of personnel involved;
- decisions made, by whom; order given to whom, by whom, and when; and actions taken, who did what, when, where, and how;
- possible exposures of site personnel; and
- histories of all injuries or illnesses during or resulting from the emergency.

In the event of an accident, all Jacobs employees will refer to Jacobs' SOP 9.1 for guidance on investigation and reporting requirements (Appendix M).

## 12.0 REFERENCES

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**Appendix A**  
**HSP Approval Sign-off Sheet**

## PLAN APPROVAL

This site plan has been written for the exclusive use of Jacobs Engineering Group, Inc., its employees, and subcontractors. Jacobs claims no responsibility for its use by others. The plan is written for the specified site conditions, dates, and personnel and must be amended if these conditions change.

PLAN APPROVED BY:

PROJECT MANAGER: Lynn J. Schuetter DATE: 7-13-94

PROGRAM HEALTH AND SAFETY MANAGER LA Velasco DATE: 7-20-94

**Appendix B**  
**Material Safety Data Sheets for Reagent Chemicals**



Baxter Healthcare Corporation  
Burdick & Jackson Division  
1953 South Harvey Street  
Muskegon, MI 49442 USA

information/emergency telephone no. 616.726.3171  
chemtrec telephone no. 800.424.9300  
canadian emergency telephone no. 613.996.6666

## MATERIAL SAFETY DATA SHEET

### HEXANE

#### I. Identification

chemical name Hexane molecular weight 86.18  
chemical family Aliphatic Hydrocarbon formula C<sub>6</sub>H<sub>14</sub>  
synonyms n-Hexane  
DOT proper shipping name Hexane  
DOT hazard class Flammable Liquid  
DOT identification no. UN1208 CAS no. 110-54-3

#### II. Physical and Chemical Data

boiling point, 760mm Hg. 68.7°C freezing point -95.3°C evaporation rate (BuAc=1) ca 10  
vapor pressure at 20°C 124 mm Hg vapor density (air=1) 3.0 solubility in water @ 20°C 0.014%  
% volatiles by volume ca 100 specific gravity (H<sub>2</sub>O=1) @ 20°C 0.659 stability Stable  
hazardous polymerization Not expected to occur.  
appearance and odor Clear, colorless liquid with a mild hydrocarbon odor.  
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents.

hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors.

#### III. Fire and Explosion Hazard Data

flash point, (test method) -26°C (Tag closed cup) auto ignition temperature 225°C  
flammable limits in air % by volume: lower limit 1.1 upper limit 7.5  
unusual fire and explosion hazards Very volatile and extremely flammable.

extinguishing media Carbon dioxide, dry chemical or foam.

special fire fighting procedures Water will not be effective in extinguishing a fire and may spread it, but a water spray can be used to cool exposed containers. Wear full protective clothing and self-contained breathing apparatus.  
Heat will build pressure and may rupture closed storage containers.

#### IV. Hazardous Components

Hexane and isomers % ca 100 TLV 50 ppm CAS no. 110-54-3

**Burdick & Jackson's Disclaimer:** The information and recommendations presented in this Material Safety Data Sheet are based on sources believed to be reliable on the date hereof. Burdick & Jackson makes no representation on its completeness or accuracy. It is the user's responsibility to determine the product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties, either express or implied, of merchantability or fitness for a particular purpose or of any other nature are made with respect to the information provided in this Material Safety Data Sheet or to the product to which such information refers. Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or additional liability or responsibility resulting from the use of, or reliance upon, this information.

## V. Health Hazards

<u>Occupational Exposure Limits</u>				<u>Concentration Immediately Dangerous to Health</u>	
OSHA	TWA	-	50 ppm	OSHA/NIOSH	5,000 ppm
	STEL	-	not listed		
	Ceiling	-	not listed		
<u>Odor Threshold</u>					
ACGIH	TLV-TWA	-	50 ppm	NSC NIOSH	not listed not listed
	TLV-STEL (15-min)	-	not listed		
NIOSH	10 hour TWA	-	100 ppm		
	15 min Ceiling	-	510 ppm		

### Carcinogenic Data

Hexane is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

### Primary Routes of Entry

Hexane may exert its effects through inhalation, skin absorption, and ingestion.

### Industrial Exposure: Route of Exposure/Signs and Symptoms

- Inhalation: Exposure can cause dizziness, numbness of extremities, and intoxication.
- Eye Contact: Liquid and high vapor concentration can be irritating.
- Skin Contact: Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.
- Ingestion: Can cause gastrointestinal tract discomfort.

### Effects of Overexposure

Hexane is a mild eye and mucous membrane irritant, primary skin irritant, central nervous system depressant and neurotoxin. Acute exposure causes irritation, narcosis, and gastrointestinal tract irritation. Chronic inhalation causes peripheral neuropathy. No systemic toxicity has been reported.

### Medical Condition Aggravated by Exposure

Preclude from exposure those individuals susceptible to dermatitis.

**Storage:** Hexane should be protected from temperature extremes and direct sunlight. Proper storage of hexane must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, hexane should be stored in an acceptably protected and secure flammable liquid storage room.

**Other:** Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

## **VII. Spill and Disposal Data**

**Spill Control:** Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

**Waste Disposal:** Dispose of hexane as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste number: D001(Ignitable).

## **VIII. SARA/Title III Data**

### Hazard Classification

Immediate Health	Yes (irritant)
Delayed Health	Yes
Fire	Yes
Sudden Release	No
Reactive	No

### Chemical Listings

Extremely Hazardous Substances	No
CERCLA Hazardous Substances	No
Toxic Chemicals	No

Hexane is not subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

**Revision Date:** July, 1989

### KEY

ca Approximately  
na Not applicable  
C Ceiling

STEL Short Term Exposure Level (15 minutes)  
TLV Threshold Limit Value  
TWA Time Weighted Average (8 hours)  
BuAc Butyl Acetate

CERCLA Comprehensive Environmental Response, Compensation and Liability Act  
NSC National Safety Council ("Fundamentals of Industrial Hygiene," 3rd. Ed., 1988)

### Emergency First Aid

- Inhalation:** Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.
- Eye Contact:** Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.
- Skin Contact:** Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.
- Ingestion:** Call local Poison Control Center for assistance. Contact physician immediately. Aspiration Hazard - Do not induce vomiting.

### **VI. Safety Measures and Equipment**

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- Ventilation:** Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.
- Respiratory:** Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).
- Eyes:** Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.
- Skin:** Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or nitrile rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to hexane may require additional protective equipment.

information/emergency telephone no. 616.726.3171  
chemtrec telephone no. 800.424.9300  
canadian emergency telephone no. 613.996.6666

## MATERIAL SAFETY DATA SHEET

### METHANOL

#### I. Identification

chemical name Methanol molecular weight 32.04  
chemical family Alcohol formula CH<sub>4</sub>O  
synonyms Carbinol, Methyl Alcohol, Wood Alcohol  
DOT proper shipping name Methyl Alcohol or Methanol  
DOT hazard class Flammable Liquid  
DOT identification no. UN1230 CAS no. 67-56-1

#### II. Physical and Chemical Data

boiling point, 760mm Hg. 64.7°C freezing point -97.7°C evaporation rate (BuAc=1) ca 5  
vapor pressure at 20°C 97 mm Hg vapor density (air=1) 1.11 solubility in water @ 20°C complete  
% volatiles by volume ca 100 specific gravity (H<sub>2</sub>O=1) @ 20°C 0.792 stability Stable  
hazardous polymerization Not expected to occur.  
appearance and odor A clear, colorless liquid with a slight alcoholic odor.  
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents and reactive metals which will displace hydrogen.

hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors such as formaldehyde.

#### III. Fire and Explosion Hazard Data

flash point, (test method) 12°C (Tag closed cup) auto ignition temperature 385°C  
flammable limits in air % by volume: lower limit 6.7 upper limit 36.5  
unusual fire and explosion hazards May burn with an invisible flame. Mixtures with water as low as 21% by volume are still flammable (flash point below 37.8°C). Under some circumstances can corrode certain metals, including aluminum and zinc, and generate hydrogen gas.  
extinguishing media Carbon dioxide, dry chemical, alcohol foam, water mist or fog.  
special fire fighting procedures Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

#### IV. Hazardous Components

Methanol % ca 100 TLV 200 ppm (skin) CAS no. 67-56-1

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## V. Health Hazards

### Occupational Exposure Limits

OSHA      TWA            - 200 ppm  
             STEL           - 250 ppm  
             Ceiling        - not listed

ACGIH     TLV-TWA       - 200 ppm  
             TLV-STEL      - 250 ppm

NIOSH      10 hour TWA - 200 ppm  
             15 min Ceiling - 800 ppm

### Concentration Immediately Dangerous to Health

OSHA/NIOSH                      25,000 ppm

### Odor Threshold

NSC                                      10 ppm  
NIOSH                                    2000 ppm

### Carcinogenic Data

Methanol is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

### Primary Routes of Entry

Methanol may exert its effects through inhalation, skin absorption, and ingestion.

### Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation:            Exposure can cause drowsiness and intoxication, headache, visual disturbance leading to blindness, coughing and shortness of breath, collapse and death at high concentrations.

Eye Contact:           Liquid can cause moderate burning, watering, swelling, and redness; high vapor concentration (greater than 2000 ppm) may cause same symptoms.

Skin Contact:           This substance may be absorbed through intact skin and produce toxic effects. Extensive, repeated and/or prolonged skin contact can cause burning, itching, redness, or blisters.

Ingestion:              Causes burning of the gastrointestinal tract and toxic effects. Swallowing more than 2 ounces of methanol can cause death.

### Effects of Overexposure

Mild poisoning is characterized by fatigue, nausea, headache, and delayed visual blurring. Moderate intoxication results in severe depression. Temporary or permanent blindness may follow in 2-6 days. In severe poisoning, symptoms progress to rapid, shallow respiration, cyanosis, coma, hypotension, dilated pupils, and visual disturbance. Death may result from respiratory failure.

### Medical Condition Aggravated by Exposure

Preclude from exposure those individuals with diseases of eyes, liver, kidneys, and lungs.

## Emergency First Aid

- Inhalation:** Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.
- Eye Contact:** Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.
- Skin Contact:** Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.
- Ingestion:** Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

### Note to Physician

In case of ingestion or massive inhalation, observe victim as an inpatient because slow metabolism causes a latent period of 24 hours between exposure and acidosis and blindness.

## **VI. Safety Measures and Equipment**

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- Ventilation:** Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.
- Respiratory:** Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).
- Eyes:** Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.
- Skin:** Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene, nitrile rubber, or rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to methanol may require additional protective equipment.

Storage: Methanol should be protected from temperature extremes and direct sunlight. Proper storage of methanol must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, methanol should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

## VII. Spill and Disposal Data

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Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements. CERCLA Reportable Quantity — 5,000 lbs.

Waste Disposal: Dispose of methanol as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste numbers: U154(Ignitable); D001(Ignitable).

## VIII. SARA/Title III Data

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<u>Hazard Classification</u>	
Immediate Health	Yes
Delayed Health	Yes
Fire	Yes
Sudden Release	No
Reactive	No

<u>Chemical Listings</u>	
Extremely Hazardous Substances	No
CERCLA Hazardous Substances	Yes
Toxic Chemicals	Yes

Methanol is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

Revision Date: July, 1989

### KEY

ca	Approximately	STEL	Short Term Exposure Level (15 minutes)
na	Not applicable	TLV	Threshold Limit Value
C	Ceiling	TWA	Time Weighted Average (8 hours)
		BuAc	Butyl Acetate

CERCLA Comprehensive Environmental Response, Compensation and Liability Act  
NSC National Safety Council ("Fundamentals of Industrial Hygiene," 3rd Ed., 1988)



# SULFURIC ACID

CAS: 7664-93-9

H<sub>2</sub>SO<sub>4</sub>

TLV-TWA, 1 mg/m<sup>3</sup>

*Sulfuric acid is a dense, oily, colorless, odorless liquid that is strongly corrosive and nonflammable. Physiochemical properties of pure anhydrous acid include:*

*Molecular weight: 98.08*

*Specific gravity: 1.84*

*Freezing point: 10.4°C*

*Boiling point: 315° to 388°C*

*Vapor pressure: < 0.001 torr at 20°C*

*Pure anhydrous acid decomposes into sulfur trioxide and water at 340°C. It is a strong dehydrating agent, reacting violently and with evolution of heat when mixed with water or alcohol. Since its vapor pressure is negligible, it exists in the air only as mist or spray.*

Fuming sulfuric acid is a mixture of H<sub>2</sub>SO<sub>4</sub> with its anhydride, SO<sub>3</sub>, in concentrations ranging from 10% to 70%. Ordinarily SO<sub>3</sub> vapor (it boils at 45°C) is rapidly converted in air to a mist of the acid by reaction with atmospheric moisture.

Sulfuric acid is the most widely used industrial chemical, being employed especially in fertilizer manufacture, petroleum refining, electroplating and acid cleaning, in storage batteries, and as a starting material for a wide variety of chemicals.

Sulfuric acid mist may be generated mechanically or by recondensation of vaporized acid. Particle size may vary from 10 µm down to below 1 µm. Condensation would tend to produce particles in the smaller size range.

Among laboratory animals, guinea pigs are more sensitive than rats, mice or rabbits.<sup>(1)</sup> Death in guinea pigs results from severe laryngeal spasm and bronchoconstriction. The LC<sub>50</sub> values for 8-hour exposure range from about 20-60 mg/m<sup>3</sup>, depending on age of the animals and particle size of the sulfuric acid mist.<sup>(2,3)</sup> Young animals (1 month) are more sensitive than adults (18 months). At concentrations which are lethal, 2.7 µm particles are more toxic than 0.8 µm particles. A concentration of 8 mg/m<sup>3</sup> (1 µm) produces no mortality, but some lung pathology following 8-hour exposures; extending the exposure time to 72 hours did not produce deaths, but did increase the severity of the lung pathology.<sup>(3)</sup> Guinea pigs exposed continuously, 24 hours a day survived concentrations up to 4 mg/m<sup>3</sup> for periods as long as 140 days, but showed some pulmonary pathology.<sup>(4)</sup>

Concentrations much lower will produce some degree of bronchoconstriction in guinea pigs exposed 1-hour as evidenced by increases in pulmonary flow-resistance.<sup>(5,6)</sup> Small particles produce the greater effect. The concentration producing a 50% increase in pulmonary flow-resistance is 0.3 mg/m<sup>3</sup> for 0.3 µm, 0.7 mg/m<sup>3</sup> for 1 µm and 6 mg/m<sup>3</sup> for 2.5 µm particles. Particles of 7 µm, which penetrate only to the upper respiratory tract and nasal passages caused a response of this magnitude only at 30 mg/m<sup>3</sup>. A TLV taking particle size into account would appear to be justifiable scientifically, but is probably not currently practical.

Alarie et al.<sup>(7)</sup> exposed monkeys continuously for two years to sulfuric acid. A concentration of 0.38 mg/m<sup>3</sup> (2.15 µm) produced slight histopathology. A concentration of 0.48 mg/m<sup>3</sup> produced a slight alteration in distribution of ventilation. A concentration of 2.43 mg/m<sup>3</sup>

(3.6 µm) produced moderate changes in both these criteria and a slight decrease in arterial O<sub>2</sub>. A concentration of 4.79 mg/m<sup>3</sup> produced moderate to severe histopathology and moderate changes in the functional criteria.

Amdur and associates<sup>(8)</sup> reported results of exposure of normal unacclimated human subjects to the inhalation of sulfuric acid mist. The concentrations ranged from 0.35 to 5 mg/m<sup>3</sup>. Exposures were from 5 to 15 minutes. Concentrations below 1 mg/m<sup>3</sup> could not be detected by odor, taste or irritation. For two persons the threshold was 1 mg/m<sup>3</sup>, a concentration of 3 mg/m<sup>3</sup> was noticed by all, and 5 mg/m<sup>3</sup> was very objectionable to some but less so to others. A deep breath at the last concentration usually produced coughing. Pneumotachograph tracings, showing respiratory changes in 15 subjects exposed to measured sulfuric acid mist concentrations, were presented in the paper.

Premysl<sup>(9)</sup> found the lungs of sulfuric acid plant workers less affected than those of workers exposed to dust. There was some evidence of corrosion of dental enamel. Raule<sup>(10)</sup> stated that the MAC for those unaccustomed to H<sub>2</sub>SO<sub>4</sub> was 1 mg/m<sup>3</sup>, but those used to it could tolerate three to four times as much. Workers chronically exposed may show various lesions of the skin, tracheo-bronchitis, stomatitis, conjunctivitis or gastritis. Malcolm and Paul<sup>(11)</sup> found severe erosion of the teeth in battery plant workers. Forming room workers (3 to 16 mg/m<sup>3</sup> of sulfuric acid mist found) were most severely affected, while charging room workers (0.8 to 2.5 mg/m<sup>3</sup>) were affected to a lesser degree.

The TLV of 1 mg/m<sup>3</sup>, as a time-weighted average, is recommended to prevent pulmonary irritation and injury to the teeth. At particle sizes likely to occur in industrial situations it should be adequate to prevent harmful effects. No STEL is recommended at this time, however, the reader is encouraged to review the section on *Excursion Limits* in the Introduction to the Chemical Substances of the current TLV booklet for guidance and control of excursions above the TLV-TWA, even when the 8-hour TWA is within the recommended limits.

Other recommendations: Cook (1945) 5 mg/m<sup>3</sup>; Smyth, Elkins, USSR, NIOSH and Czechoslovakia, 1 mg/m<sup>3</sup>. This limit also recommended by West and East Germany and Sweden.

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4. Thomas, M.D., R.H. Hendricks, F.D. Gunn and J. Critchlow: *Arch. Ind. Hyg. Occup. Med.* 17:70 (1958).
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10. Raule, A.: *Med. d. Lavoro* 45:59 (1954); abstract in *Am. Ind. Hyg. Assoc. Q.* 16:153 (1955).
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# Occupational Health Guideline for Nitric Acid

## INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

## SUBSTANCE IDENTIFICATION

- Formula:  $\text{HNO}_3$
- Synonyms: Aqua fortis; white fuming nitric acid (WFNA); red fuming nitric acid (RFNA); hydrogen nitrate
- Appearance and odor: Colorless, yellow, or red fuming liquid with a suffocating, acrid odor.

## PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for nitric acid is 2 parts of nitric acid per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 5 milligrams of nitric acid per cubic meter of air ( $\text{mg}/\text{m}^3$ ). NIOSH has recommended a permissible exposure limit of 2 ppm averaged over a work shift of up to ten hours per day, forty hours per week. The NIOSH Criteria Document for Nitric Acid should be consulted for more detailed information.

## HEALTH HAZARD INFORMATION

### • Routes of exposure

Nitric acid can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It can also affect the body if it is swallowed.

### • Effects of overexposure

**1. Short-term Exposure:** Nitric acid vapor or mist is an irritant of the eyes, nose, throat, and skin. Liquid nitric acid or high concentrations of nitric acid vapor may cause severe burns of the eyes with permanent damage. Liquid nitric acid or high concentrations of nitric acid

vapor may produce skin burns and ulcers. Nitric acid may stain the skin a bright yellow. Exposure to high concentrations of nitric acid vapor may cause severe breathing difficulties which may be delayed in onset and may also cause pneumonia. Swallowing nitric acid may cause burns of the mouth, throat, and stomach.

**2. Long-term Exposure:** Repeated or prolonged exposure to nitric acid mists or strong concentrations of nitric acid vapors may cause erosion of the exposed teeth.

**3. Reporting Signs and Symptoms:** A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to nitric acid.

### • Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to nitric acid at potentially hazardous levels:

#### **1. Initial Medical Examination:**

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the eyes, respiratory tract, skin, and teeth should be stressed. The skin should be examined for evidence of chronic disorders.

—14" x 17" chest roentgenogram: Nitric acid causes human lung damage. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Nitric acid is a respiratory irritant. Persons with impaired pulmonary function may be at increased risk from exposure. Periodic surveillance is indicated.

—Eye disease: Nitric acid is a severe eye irritant and may cause tissue damage. Those with pre-existing eye problems may be at increased risk from exposure.

—Skin disease: Weak nitric acid is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

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These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service    Centers for Disease Control  
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR  
Occupational Safety and Health Administration

2. **Periodic Medical Examination:** The aforementioned medical examinations should be repeated on an annual basis or at some other frequency to be determined by the responsible physician.

• **Summary of toxicology**

Nitric acid vapor or mist is an irritant of the eyes, mucous membranes, and skin. When nitric acid is exposed to air or comes in contact with organic matter, it decomposes to yield a mixture of toxic oxides of nitrogen, including nitric oxide and nitrogen dioxide. Exposure to high concentrations of nitric acid vapor or mist causes pneumonitis and pulmonary edema which may be fatal; onset of symptoms may be delayed for 4 to 30 hours. In contact with the eyes, the liquid produces severe burns which may result in permanent damage and visual impairment. On the skin, the liquid or concentrated vapor produces immediate, severe and penetrating burns; concentrated solutions cause deep ulcers and stain the skin a bright yellow or yellowish-brown color. The vapor and mist may erode the exposed teeth. Ingestion of the liquid will cause immediate pain and burns of the mouth, esophagus, and gastrointestinal tract.

## CHEMICAL AND PHYSICAL PROPERTIES

• **Physical data**

1. Molecular weight: 63 (solute)
2. Boiling point (760 mm Hg): 121.6 C (251 F) (for "constant boiling," 68%); 84 C (183 F) (white fuming nitric acid); 60 C (140 F) (red fuming nitric acid)
3. Specific gravity (water = 1): 1.41 (constant boiling); 1.5 (white fuming); 1.55 (red fuming)
4. Vapor density (air = 1 at boiling point of nitric acid): 2 - 3 approximately
5. Melting point: -41 C (-42 F) (for "constant boiling," 68%); -41.6 C (-43 F) (white fuming); -52 C (-61 F) (red fuming)
6. Vapor pressure at 20 C (68 F): 2.9 mm Hg (HNO<sub>3</sub>) (constant boiling), 2.6 mm Hg (H<sub>2</sub>O) (constant boiling); 62 mm Hg (white fuming); 103 mm Hg (red fuming)
7. Solubility in water, g/100 g water at 20 C (68 F): Miscible in all proportions
8. Evaporation rate (butyl acetate = 1): Data not available

• **Reactivity**

1. Conditions contributing to instability: Elevated temperatures may cause containers to burst and liberate toxic oxides of nitrogen.
2. Incompatibilities: Reacts explosively with combustible organic or readily oxidizable materials such as wood, turpentine, metal powders, hydrogen sulfide, etc. Contact with strong bases may cause violent spattering.
3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen) may be released when nitric acid decomposes.
4. Special precautions: Nitric acid will attack some forms of plastics, rubber, and coatings.

• **Flammability**

1. Not combustible, but is a strong oxidizer.

• **Warning properties**

1. Odor Threshold: No quantitative information is available concerning the odor threshold of nitric acid.
2. Eye Irritation Level: The AIHA *Hygienic Guide*, concerning eye contact with nitric acid, states that "nitric acid produces very severe immediate damage which may result in permanent damage and visual impairment."

3. Other Information: The AIHA *Hygienic Guide* notes that "nitrous fumes," expressed in terms of nitrogen dioxide, may cause immediate irritation of the throat at concentrations as low as 62 ppm."

4. Evaluation of Warning Properties: Patty points out that "nitric acid manufacture is more hazardous than hydrochloric acid manufacture in that . . . the oxides of nitrogen have inadequate warning properties in low, toxic concentrations." For the purposes of this guideline, nitric acid is treated as a material with poor warning properties.

## MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Nitric acid may be measured by collection of nitric acid in a midget impinger, followed by ultraviolet spectrophotometric analysis. An analytical method for nitric acid is in the *NIOSH Manual of Analytical Methods*. 2nd

## RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

## PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with liquid nitric acid or liquids containing nitric acids having a pH equal to or less than 2.5.
- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with solutions containing nitric acid having a pH greater than 2.5.
- Clothing contaminated with nitric acid should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of nitric acid from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the nitric acid, the person performing the operation should be informed of nitric acid's hazardous properties.
- Where there is any possibility of exposure of an employee's body to liquid nitric acid or solutions containing nitric acid having a pH equal to or less than 2.5, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.
- Non-impervious clothing which becomes contaminated with nitric acid should be removed immediately and not reworn until the nitric acid is removed from the clothing.
- Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of liquid nitric acid or solutions containing nitric acid contacting the eyes.
- Where there is any possibility that employees' eyes may be exposed to liquid nitric acid or solutions containing nitric acid having a pH equal to or less than 2.5, an eye-wash fountain should be provided within the immediate work area for emergency use.

## SANITATION

- Skin that becomes contaminated with nitric acid should be immediately washed or showered to remove any nitric acid.

## COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to nitric acid may occur and control methods which may be effective in each case:

### Operation

Use in metallurgy as a pickling agent; in metal refining, ore recovery, metal etching, and photoengraving

Use in acidulation of phosphate rock and manufacture of nitrogen solutions for use in fertilizer industry

Use as a laboratory reagent; in wood pulping industry

Use during inorganic synthesis in manufacture of fertilizers, explosives, herbicides, antibiotics, meat-curing, pickling, ceramics, and pharmaceuticals

Use during organic synthesis in manufacture of nitrating and oxidizing agents, nylons, foams, lubricants, insecticides, dyes, explosives, photographic films, lacquers, and celluloids

### Controls

Local exhaust ventilation; general dilution ventilation; personal protective equipment

Local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

## EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

### • Eye Exposure

If nitric acid or strong concentrations of nitric acid vapors get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

### • Skin Exposure

If nitric acid or strong concentrations of nitric acid vapors get on the skin, immediately flush the contaminated skin with water. If nitric acid soaks through the clothing, remove the clothing immediately and flush the skin with water. Get medical attention immediately.

### • Breathing

If a person breathes in large amounts of nitric acid, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration.

Keep the affected person warm and at rest. Get medical attention as soon as possible.

- **Swallowing**

When nitric acid has been swallowed and the person is conscious, give the person large quantities of water immediately to dilute the nitric acid. Do not attempt to make the exposed person vomit. Do not make an unconscious person vomit. Get medical attention immediately.

- **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

## **SPILL, LEAK, AND DISPOSAL PROCEDURES**

- Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

- If nitric acid is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.

2. Flush with copious quantities of water and neutralize with alkaline material (such as soda ash, lime, etc)..

- Waste disposal method:

Nitric acid may be disposed of by neutralizing with water and alkaline material (such as soda ash, lime, etc). and disposing in a secured sanitary landfill.

## **REFERENCES**

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## RESPIRATORY PROTECTION FOR NITRIC ACID

Condition	Minimum Respiratory Protection* Required Above 5 mg/m <sup>3</sup>
Particulate or Vapor Concentration	
250 mg/m <sup>3</sup> or less	<p>A chemical cartridge respirator with a full facepiece providing protection against nitric acid.**</p> <p>A gas mask with a chin-style or a front- or back-mounted organic vapor canister providing protection against nitric acid.</p> <p>Any supplied-air respirator with a full facepiece, helmet, or hood.</p> <p>Any self-contained breathing apparatus with a full facepiece.</p> <p>A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.</p>
Greater than 250 mg/m <sup>3</sup> *** or entry and escape from unknown concentrations	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</p> <p>A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.</p>
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	<p>Any gas mask containing non-oxidizable sorbents and providing protection against nitric acid.</p> <p>Any escape self-contained breathing apparatus.</p>

\*Only NIOSH-approved or MSHA-approved equipment should be used.

\*\*Nitric acid is an oxidizer and should not come in contact with oxidizable materials. Some cartridges and canisters may contain oxidizable materials, such as activated charcoal, and therefore should not be used to provide protection against nitric acid. Only non-oxidizable sorbents are allowed.

\*\*\*Use of supplied-air suits may be necessary to prevent skin contact while providing respiratory protection from airborne concentrations of nitric acid; however, this equipment should be selected, used, and maintained under the immediate supervision of trained personnel. Where supplied-air suits are used above a concentration of 250 mg/m<sup>3</sup>, an auxiliary self-contained breathing apparatus operated in positive pressure mode should also be worn.

**Appendix C**  
**Cold Stress Monitoring**

JACOBS ENGINEERING GROUP INC.  
CORPORATE HEALTH AND SAFETY MANUALCOLD STRESS MONITORING  
SOP NO. 7.2REVISION NO. 1  
DATE 2/91  
PAGE 1 OF 5

APPROVED:

  
HEALTH AND SAFETY MANAGER**OBJECTIVE**

This standard operating procedure describes the procedures for cold stress monitoring of personnel engaged in field work activities.

**APPLICABILITY**

This procedure applies to all Jacobs employees who perform field work in cold weather and who are at risk of developing cold stress.

**REFERENCES**

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990-91, Cincinnati, Ohio, 1990.

**PROCEDURE**

Frostbite and hypothermia are two types of cold injury which personnel must be protected against during the performance of field activities. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F (see Table 7-2-1). As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident.

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia, whole body protection must be provided.

Adequate insulating clothing to maintain core temperatures above 36°C (96.8°F) will be provided to workers. The equivalent chill temperature (see Table 7-2-1) should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.



TABLE 7-2-1

COOLING POWER OF  
WIND ON EXPOSED FLESH  
EXPRESSED AS  
EQUIVALENT TEMPERATURE  
(UNDER CALM CONDITIONS)

Estimated Wind Speed (in mph)	Actual Temperature Reading ( F°)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature ( F°)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-132
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER				INCREASING DANGER				GREAT DANGER			
	In < hr with dry skin.				Danger from freezing of				Flesh may freeze within			
	Maximum danger of				exposed flesh within one				30 seconds.			
	false sense of security											
	Trenchfoot and immersion foot may occur at any point on this chart.											

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1987-1988, Cincinnati, Ohio, 1987



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Core body temperatures lower than 96.8°F will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences. Unless there are unusual or extenuating circumstances cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia.

**Evaluation and Control**

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -32°C (-25°F). Superficial or deep local tissue freezing will occur only at temperatures below -1°C (30°F) regardless of wind speed.

At air temperatures of 2°C (35.6°F) or less it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

Limits for properly clothed workers for periods of work at temperatures below freezing are shown in Table 7-2-2.

If available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7°C (20°F) heated warming shelters (tents, trailers, etc.) shall be made available nearby and the workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect.

cepf12

TABLE 7-2-2

Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

Air Temperature - Sunny Sky	No Noticeable Wind				5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
0°C (approx.)	0°F											
1. -26° to -28°	-15° to -19°	(Norm. Breaks) 1	(Norm. Breaks) 1	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease
2. -29° to -31°	-20° to -24°	(Norm. Breaks) 1	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
3. -32° to -34°	-25° to -29°	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
4. -35° to -37°	-30° to -34°	3	40 min	4	30 min	5	Non-emergency work should cease					
5. -38° to -39°	-35° to -39°	4	30 min	5	Non-emergency work should cease							
6. -40° to -42°	-40° to -44°	5	Non-emergency work should cease									
7. -43° & below	-45° & below	Non-emergency work should cease										

Notes:

- Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
- The following is suggested as a guide for estimating wind velocity if accurate information is not available:  
5mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990-1991, Cincinnati, Ohio, 1990.



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For work practices at or below  $-12^{\circ}\text{C}$  ( $10^{\circ}\text{F}$ ) ECT the following shall apply:

1. The worker shall be under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, test periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
3. New employees shall not be required to work full-time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
4. The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used.
5. The workers shall be instructed in safety and health procedures. The training program shall include as a minimum instruction in:
  - a. Proper re-warming procedures and appropriate first aid treatment.
  - b. Proper clothing practices.
  - c. Proper eating and drinking habits.
  - d. Recognition of impending frostbite.
  - e. Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
  - f. Safe work practices.

**Appendix D**  
**Heat Stress Monitoring**



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## HEAT STRESS MONITORING SOP NO. 7.1

REVISION NO. 1  
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APPROVED:

  
HEALTH AND SAFETY MANAGER

### OBJECTIVE

This standard operating procedure describes the procedures for heat stress monitoring of personnel engaged in field work activities.

### APPLICABILITY

This procedure applies to all Jacobs employees who perform field work in hot weather and who are at risk of developing heat stress.

### REFERENCES

NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990-91, Cincinnati, Ohio, 1990.

### PROCEDURE

Heat-induced physiological stress (heat stress) occurs when the body fails to maintain a normal body temperature. A number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow the ACGIH Threshold Limit Value recommendations for suggested work/rest schedules listed in Table 7-1-1. This work/rest schedule is determined by the Wet Bulb Globe Temperature Index (WBGT), a measure of environmental factors which most nearly correlate with deep body temperature and other physiological responses to heat. WBGT values are calculated by the following equations:



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1. Outdoors with solar load

$$WBGT = 0.7 \text{ NWB} + 0.2 \text{ GT} + 0.1 \text{ DB}$$

2. Indoors or Outdoors with no solar load

$$WBGT = 0.7 \text{ NWB} + 0.3 \text{ GT}$$

where:

WBGT = Wet Bulb Globe Temperature  
NWB = Natural Wet Bulb Temperature  
DB = Dry-Bulb Temperature  
GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer. Commercially available instruments can be used for convenient measurement of WBGT.

For workers wearing semipermeable or impermeable encapsulating ensembles and/or levels of protection A, B, or C, the recommendations listed in Table 7-1-1 cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 70°F (21°C).

To monitor these workers, measure:

1. Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.
  - a. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
  - b. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.
2. Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).



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TABLE 7-1-1  
WORK - REST REGIMEN <sup>1</sup>

WBGT TEMPERATURE IN WHICH VARIOUS WORK LOADS ARE PERFORMED [F° (C°)]			
WORK-REST REGIMEN	LIGHT <sup>2</sup>	MODERATE <sup>3</sup>	HEAVY <sup>4</sup>
Continuous work permitted	86.0 (30.0)	80.1 (26.7)	77.0 (25.0)
75% work 25% rest, each hour	87.1 (30.6)	82.4 (28.0)	78.6 (25.9)
50% work 50 % rest, each hour	88.5 (31.4)	84.9 (29.4)	82.2 (27.9)
25% work 75% rest, each hour	90.0 (32.2)	88.0 (31.1)	86.0 (30.0)

<sup>1</sup> Adapted from "Permissible Heat Exposure Threshold Limit Values" in Threshold Limit Values and Biological Exposure Indices for 1990-1991, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1990, p. 69.

<sup>2</sup> Light work (up to 200 Kcal/hr or 800 Btu/hr): e.g., sitting or standing to control machines, performing light hand or arm work, etc.

<sup>3</sup> Moderate work (200-300 Kcal/hr or 800-1400 Btu/hr): e.g., walking about with moderate lifting and pushing, etc.

<sup>4</sup> Heavy work (350-500 Kcal/hr or 1400-2000 Btu/hr): e.g., sampling work, pick and shovel work, etc.





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TABLE 7-1-2  
SUGGESTED FREQUENCY OF  
PHYSIOLOGICAL MONITORING FOR FIT AND  
ACCLIMATIZED WORKERS<sup>5</sup>

ADJUSTED TEMPERATURE <sup>6</sup>	NORMAL WORK ENSEMBLE <sup>7</sup>	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Source: NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985, p. 8-22.

5 For work levels of 250 kilocalories/hour.

6 Calculate the adjusted air temperature ( $t_{a \text{ adj}}$ ) by using this equation:  $t_{a \text{ adj}}^{\circ\text{F}} = t_a^{\circ\text{F}} + (13 \times \% \text{ sunshine})$ . Measure air temperature ( $t_a$ ) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

7 A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.



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## HEAT STRESS MONITORING SOP NO. 7.1

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- a. If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
  - b. If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.
  - c. Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).
3. Body water loss. Measure weight on a scale accurate to  $\pm 0.25$  lb. at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 7-1-2). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

### PREVENTION

Proper training and preventative measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. One or more of the following recommendations will help reduce heat stress:

1. Adjust work schedules:
  - a. Modify work/rest schedules according to monitoring requirements.
  - b. Mandate work slowdowns as needed.
  - c. Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
  - d. Add additional personnel to work teams.
  - e. Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
2. Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.



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3. Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 18 ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
  - a. Maintain water temperature at 50° to 60°F (10° to 15.6°C).
  - b. Provide small disposable cups that hold about 4 ounces (0.1 liter).
  - c. Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - d. Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
  - e. Weigh workers before and after work to determine if fluid replacement is adequate.
4. Encourage workers to maintain an optimal level of physical fitness:
  - a. Acclimatize workers to site work conditions: temperature, protective clothing, and workload.
  - b. Urge workers to maintain normal weight levels.
5. Wear long cotton underwear under chemical protective clothing. Cotton will aid in absorbing perspiration and will hold it close to the skin, which will provide the maximum amount of cooling from the limited evaporation that takes place underneath the chemical resistant clothing.
6. Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:
  - a. Field showers or hose-down areas to reduce body temperature and/or to cool off protective clothing.
  - b. Cooling jackets, vests, or suits.

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7. Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress. These are:
- a. Heat Rash: caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Symptoms include a decreased ability to tolerate heat as well as being a nuisance.
  - b. Heat Cramps: caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.
  - c. Heat Exhaustion: caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool moist skin; profuse sweating; dizziness and lassitude; nausea; fainting.
  - d. Heat Stroke: the most severe form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Body must be cooled immediately to prevent severe injury and/or death. Competent medical help must be obtained immediately. Signs and symptoms are: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

**Appendix E**  
**Utility Clearance**

## UTILITY CLEARANCE

### 1.0 PURPOSE

- 1.1 This standard operating procedure describes procedures to reduce the risk of contact with buried or above ground utility service lines.

### 2.0 SCOPE

- 2.1 This SOP applies to all field activities where there is possible contact with above ground utilities or sub-surface utilities.

### 3.0 REFERENCES

- 3.1 OSHA 1926.650 - 1926.652 Excavations
- 3.2 Underground Services - State Standards (e.g. California, Title 1 CCR 4216)
- 3.3 OSHA 1926.955 Provisions for Preventing Accidents Due to Proximity to Overhead Lines
- 3.4 OSHA 1910.333 Selection and Use of Work Practices in Sub-part S - Electrical

### 4.0 RESPONSIBILITIES

- 4.1 It is the responsibility of the *Project Manager* (PM) to assure full compliance with this SOP.
- 4.2 The *Site Manager* (SM) shall implement this SOP on site.
- 4.3 The *Site Health and Safety Officer* (SHSO) shall assure full compliance with the SOP and report any deficiencies to the Health and Safety Manager and the Project Manager.

### 5.0 PROCEDURES

#### 5.1. Buried Utilities

A review will be made of any available property maps, blue lines, or as-builts prior to site activities.

5.1.1. During the project site walk, any discrepancies or new information regarding utility locations will be added to project maps.

5.1.2 If the project is located on Federal land, if possible, facility personnel (Base or facility engineering) should provide utility clearance and sign off. If work is for a government facility, the Site Manager shall obtain and submit the property facility utility service clearance request forms. If work is within a local government jurisdiction, the Site Manager shall notify the local utility locator service using standard geophysical methods such as electromagnetic (EM), ground penetrating radar (GPR), magnetic gradient survey and/or a pipe locator. Two methods will be relied on. Utility locations will be marked using the following color code, unless the facility locator uses a different color code:

white	work location
red	electrical
yellow	gas or oil
orange	telephone
blue	water
green	sewer

- 5.1.3 If the project occurs in a state which has an agency doing utility clearances, they will be notified. State Underground Service Alert (USA) or other designation in a given state will be notified prior to commencing field work per their requirements. USA will assign a "ticket" number to your site which will need to be recorded. This ticket number is valid for a limited time but, may be extended by contacting USA again. USA will notify utility representatives who will mark according to the utilities' color scheme.<sup>1</sup>
- 5.1.4 After utilities have been marked by the federal, state or local locator service, the Site Manager will clear utilities.
- 5.1.5 In addition to geophysics, borings will be hand augured to a minimum of seven feet for all locations within developed areas where there is a potential to impact buried utilities. The hole must be reamed by hand to at least the diameter of the drill rig auger or bit prior to drilling. For soil gas surveys, the survey probe shall be placed as close as possible to the hand auger.
- 5.1.6 Methods for utility clearance for horizontal and slant boring will be determined by the Project Manager and Health & Safety Manager.
- 5.1.7 All uncovered utilities must be supported. Any repairs or modifications to existing utility lines require the line to be locked-out/tagged-out prior to work.
- 5.1.8 At each location where trenching or excavating will occur using a backhoe or other heavy equipment, prior to ground-breaking, the soil must be probed with a magnetometer and/or a pole made of non-conductive material. Additional requirements for trenching/excavating activities can be found in Jacobs Safety Manual, Section 10.9.4.

---

<sup>1</sup> In California USA will not locate utilities on federal property, but will have information on any easements.

5.2. Above Ground Power Lines

The following table gives the required minimum clearances for working in proximity to overhead power lines.

<u>Nominal Voltage</u>	<u>Minimum Clearance</u>
0 -50 KV	10 ft., or one mast length; whichever is greater
50 KV+	10 ft. + 4 in. for every 10 KV over 50 KV or 1.5 mast lengths; whichever is greater

If it is necessary to work without the minimum clearance, the overhead line must be de-energized or re-routed by the utility company or a competent electrician.

5.3 Approval

Utility Clearance Form 7-1 must be completed and signed-off by the Site Manager prior to commencement of relevant site work.

Any deviations from this SOP must be approved by the Project Manager after collaboration with Health and Safety Manager. Approval via telephone is acceptable in the event the Project Manager is not on site.

5.4 Existing Utility Repair

When repairing existing utilities, refer to the Jacob's Lock-Out and Tag-Out Procedure (Section 8.9 in the Safety Manual).



UTILITY CLEARANCE FORM 7-1

Project: \_\_\_\_\_ Completed by: \_\_\_\_\_

Site Location: \_\_\_\_\_ Date: \_\_\_\_\_

Circle One  
yes no n/a

1. Review of Existing Maps

2. Above Ground Utilities

a) marked on site maps

yes no n/a

b) necessary to lockout

yes no n/a

c) document procedures used to lockout or re-route

yes no n/a

3. Underground Utilities

a) State Agency called by: \_\_\_\_\_  
Date: \_\_\_\_\_ Ticket Number \_\_\_\_\_

yes no n/a

b) Geophysical clearance method(s) used

yes no n/a

By: \_\_\_\_\_ Date: \_\_\_\_\_

c) Utilities marked on site

map (attached) by: \_\_\_\_\_ Date: \_\_\_\_\_

yes no n/a

4. Hand auguring completed to \_\_\_\_\_ feet

yes no n/a

By whom: \_\_\_\_\_ Date: \_\_\_\_\_

5. Trench/excavation probed

yes no n/a

6. Approval:

\_\_\_\_\_  
Site Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Client Rep

\_\_\_\_\_  
Date

7. Deviations from SOP Approval:

\_\_\_\_\_  
Project Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Health and Safety Manager

\_\_\_\_\_  
Date

cc: Project File

**Appendix F**  
**Physical Control Hazards**

## **PHYSICAL HAZARD CONTROL PROCEDURES**

### **MOTOR VEHICLE SAFETY**

The following motor vehicle safety procedures will be used by site personnel.

Personnel will not enter or exit from moving vehicles. Personnel will not ride in the bed of any vehicle.

The use of seat belts is mandatory for all vehicle occupants in government and private vehicles while operating on Indian Mountain LRRS. Random seat belt checks may be conducted on Indian Mountain LRRS.

Travel precautions will be followed when working within or adjacent to Indian Mountain LRRS:

- Avoid overexposure to the sun. Sunburn can be very serious and heat stroke or heat exhaustion can be fatal. Section 3.2.6 identified the signs, symptoms, and treatments for heat stress-related exposures.
- Carry drinking water. Plastic containers are preferable to metal containers or water bags.
- Frequently check the gasoline, oil, and water temperature gauges of the vehicle.
- Keep tires at normal inflation pressure. Soft tires generate heat and cause blowouts.
- Road grades can be deceptive. On hot days, shift to a lower gear on grades and drive slowly to avoid overheating the engine.
- Watch the temperature gauge. If the vehicle is air conditioned and the gauge indicates that the engine is close to overheating, turn off the air conditioner. If the engine overheats, pull to the side of the road but do not stop the motor. Turn on the heater and while the car is at fast idle, slowly pour water over the radiator core to cool it. Refill the radiator to its proper level only after the engine has cooled; the motor should be kept running.
- If the vehicle develops vapor lock, wrap a wet cloth around the fuel pump and the line to cool them.
- Stay with the vehicle. If it breaks down, stay in the shade provided by the vehicle and wait for help to arrive. Do not attempt to walk in the hot sun for assistance.

### **DRILL RIG SAFETY**

Drilling rigs and associated equipment will be used in support of field activities to be conducted at Indian Mountain LRRS. Drilling rig maintenance and safety is the responsibility of the drilling operator.

All drilling rigs and associated equipment will be maintained in proper operating condition according to the manufacturer's specifications. A daily written inspection will be kept to ensure proper maintenance and to identify any defects or problems that may arise. Any defects or problems found must be corrected immediately. Any fluids, other than water, that leak onto the ground will be cleaned up by the drilling subcontractor.

All hand tools are to be used for their intended purpose and must be in good, clean condition. Rope and wire will, at a minimum, be inspected once a week. The rope and wire will be used only for the intended purpose.

When preparing to drill, the drill rig must be secured. When drilling is in progress, personnel will keep away from the augers at all times. The following are provided as general guidelines for safe practices on the site during drilling operations:

- The supplier of the drill rig will ensure that equipment is well maintained, meets existing safety requirements, and is inspected regularly and before releasing to new projects.
- A fully qualified person will operate the rig and equipment, identify pending failures, and supervise the other drillers on the project.
- Transport of the rig to the work site will be done by a person with the proper commercial license.
- To the extent possible, the terrain should be level and the ground should be stable so that unexpected movement of the rig will be unlikely. Tugger and anchor lines will be used to secure the rig if the slope is hazardous.
- All power transmission equipment, prime movers, and machine parts of rotary drilling equipment must be guarded. Chains and sprockets will be enclosed to prevent accidental contact.
- Employees involved in the operation will not wear any loose-fitting clothing, jewelry, or unrestrained long hair which could get caught in any exposed moving machinery. Footwear should be steel toe.
- If any air or hydraulic lines are visible and uncovered they will be secured in such a way that a failure would not allow them to whip around.
- Dust suppression will be used to control emissions.
- Emergency stop devices are required for the prime movers on drilling rigs to allow the operator or others to quickly respond to an emergency and prevent an accident or, at least, limit the injury. Emergency stops must be manually reset before restarting prime movers.
- The area will be roped off, marked, or personnel posted to keep the area clear of pedestrians or spectators.
- A 20-pound, A:B:C fire extinguisher will be readily available for use.
- A communication system among the driller, driller's helper, geologist, and other site personnel will be used.

- Engaging the auger to the power coupling will follow recommended manufacturer's procedures.
- Contact with the power coupling or auger during rotation will be minimized.
- Food and beverages will not be consumed or stored in operational areas.
- The route of travel will be inspected before moving the drill rig off the road. Rocks, trees, erosion, uneven surfaces, and utilities will be noted.
- All passengers will exit from the vehicle when moving the drill rig onto uneven or sloped terrain.
- Personnel will engage multiple-drive power trains (when available) on the drill rig vehicle when mobilizing off the road.
- Personnel will travel upgrade or downgrade on slopes when feasible. Avoid off-camber or traverse approaches to drill sites.
- Spotters will be used to provide guidance when vertical and lateral clearance is questionable.
- The drill rig mast will be lowered during travel. All loads will be secured to the drill rig during travel.
- Overhead and buried utilities will be located before drilling operations.
- Tools, materials, and supplies will be properly stored to allow safe handling by drill crew personnel. Proper storage on racks or sills will prevent spreading, rolling, or sliding. Storage or transportation of tools, materials, or supplies within the drill rig derrick will be avoided.
- Gasoline will be stored in containers specifically designed and approved for such use.
- Working surfaces will be maintained free of obstructions or potentially hazardous substances.
- Eye protection will be worn when chipping, chiseling, or breaking material that presents a risk of flying objects.
- Wire rope, hoisting hardware, swivels, hooks, bearings, sheaves, guides, rollers, clutches, brakes, etc., will be inspected for the following:
  - abrasions,
  - breaks,
  - wear,
  - fatigue,
  - corrosion,
  - jamming, and
  - kinking.

- Loads will not be hoisted directly over field personnel. Suspended loads will not be left unattended. Personnel will maintain a safe hand distance from hoisting equipment (e.g., wire rope, hooks, pinch points) when the slack is reduced.
- Auger boring will begin slowly with the drive engine operating at low rotations per minute.

**Appendix G**  
**Employee Certification Form**

<b>EMPLOYEE CERTIFICATION FORM</b>
------------------------------------

By my signature, I certify that I have read, understand, and will abide by, the Health and Safety Plan for the Indian Mountain LRRS facility.

**Date**

This image shows a single sheet of white paper with horizontal black ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



**Appendix H**  
**Bloodborne Pathogens**

## **BLOODBORNE PATHOGEN EXPOSURE CONTROL**

### **1.0 OBJECTIVE**

- 1.1 This standard operating procedure describes procedures for control of and medical response to bloodborne pathogen exposures. This SOP provides compliance to OSHA standard 1910.1030 - Bloodborne Pathogens; which is designed to reduce occupational exposure to human blood and certain body fluids and tissues that are potentially infectious for Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV), and other bloodborne pathogens.

### **2.0 APPLICABILITY**

- 2.1 This SOP applies to all Jacobs site personnel who as an ancillary duty may provide First Aid/CPR in an emergency situation. These employees must maintain active bloodborne pathogens training as well as active CPR and First Aid training.
- 2.2 The control procedures presented in this SOP should be followed for any employee with exposure to human blood or other body fluids possibly contaminated with blood during the course of their job duties.

### **3.0 REFERENCES**

- 3.1 OSHA 29 CFR 1910.1030 - Bloodborne Pathogens, March 6, 1992.
- 3.2 U.S. Department of Health and Human Services, Guidelines for Prevention of Transmissions of Human Immunodeficiency Virus and Hepatitis B Virus to Health Care and Public Safety Workers, February 1989.

### **4.0 METHOD OF COMPLIANCE**

- 4.1 Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. "Universal precautions" means that you assume all blood is infectious and take the necessary protective measures.

### **5.0 COMMUNICATION OF HAZARDS**

- 5.1 To be sure that all employees recognize infectious hazards and that infectious materials are treated with special care, OSHA requires special labeling and identification.
- 5.2 Place potentially infectious materials in leakproof containers. Place sharp objects in puncture-resistant containers. The containers must be either red in color or clearly labeled with orange or orange/red labels with the biohazard symbol and lettering in a contrasting color.

5.3 The waste must be disposed of according to specific state and local contaminated waste disposal rules. One of two steps must be taken to obtain this information.

1. Contact the state and local waste disposal authorities beforehand.  
or
2. At the time of incident, place the contaminated materials in the proper containers. Contact the proper state and local waste disposal authorities for instructions as to the disposal of the contaminated waste.

## 6.0 EXPOSURE DETERMINATION

6.1 The anticipated exposure risks are associated with medical emergencies requiring CPR, the stabilizing of a victim bleeding or with an open wound, clean-up of blood, body fluids, or tissues, or broken or sharp objects that might be contaminated with blood.

6.2 For control purposes, all human blood, body fluids possibly contaminated with blood, and certain body fluids<sup>1</sup> will be considered potentially infectious for HBV and HIV and every effort should be made to avoid contact.

## 7.0 CONTROL PROCEDURES

7.1 For First Aid response in which the victim is bleeding, vomiting, or has any open wound, the responder shall wear disposable gloves. If the response involves bleeding control, the responder should wear protective clothing and protective eyewear. Additionally, if the bleeding control involves spurting blood, the responder should also wear goggles or a face shield.

7.2 When providing CPR, the responder shall wear disposable gloves and use a one-way inhaler barrier (to be included with all First Aid kits).

7.3 After completion of any emergency response procedures described above, the responding personnel shall decontaminate protective equipment, dispose of all disposable protective clothing and wash all skin surfaces potentially contaminated. Any work surface contaminated shall be cleaned with a detergent solution. All contaminated materials shall be disposed of in compliance with the above Communication of Hazards section.

## 8.0 INCIDENT INVESTIGATION AND NOTIFICATION

8.1 The Site Health and Safety Officer or Office Health and Safety Coordinator must promptly conduct the incident investigation and notify the Corporate Health and Safety Manager of the incident. The exposure incident investigation must document the following information:

---

<sup>1</sup>Cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, vaginal secretions, semen, breast milk, and any unfixed human tissue or organ.

8.1.1 The circumstances surrounding the exposure incident and identification of the emergency response personnel and source individual.

8.1.2 Work practice controls in place at the time of the incident.

8.1.3 Personal protective equipment and/or clothing in use at the time of the incident.

8.1.4 Any failures of the above controls at the time of the incident.

## **9.0 POST EXPOSURE EVALUATION**

9.1 The exposed employee shall be referred immediately to the medical clinic chosen by Jacobs in coordination with Jacobs Medical Consultant for a confidential medical evaluation and follow-up.

9.2 Jacobs shall provide the following information to the health care professional:

9.2.1 A copy of OSHA 1910.1030.

9.2.2 A description of employee's duties as they relate to exposure incident.

9.2.3 Documentation of route(s) of exposure and circumstances in which exposure occurred.

9.2.4 Results of source individual's blood testing, if available.

9.2.5 All medical records relevant to appropriate treatment of employee.

9.3 The evaluation and follow-up should include at the least the following elements:

9.3.1 Documentation of the route(s) of exposure and circumstances under which the exposure incident occurred.

9.3.2 Identification of source individual.

9.3.3 The source individual's blood shall be tested as soon as feasible and after consent is obtained in order to determine HBV or HIV infectivity. When source individual is already known to be infected with HBV or HIV, testing need not to be repeated.

- 9.3.4 Results of the source individual's testing shall be made available to exposed employee and employee shall be informed of applicable laws and regulations concerning disclosures.
- 9.3.5 The exposed employee shall be tested for HBV and HIV serological status after consent is received. If employee consents to baseline collection, but not to HIV serology, the blood sample shall be preserved at least 90 days after exposure incident and be made available for testing at a later date at the employee's election.
- 9.4 The employee shall be counseled by the physician regarding the risk of HIV, HBV, and other bloodborne pathogen infections.
- 9.5 If the exposure source material is negative for HIV antibody or is not available for examination, the employee may be retested six months and one year after the initial test.
- 9.6 All testing and counseling shall be undertaken with confidentiality, at no cost to the employee, made available at a reasonable time and place, performed by or under the care of a licensed physician, and be provided according to U.S. Public Health Service.

## 10. HEPATITIS B VACCINATION

- 10.1 Jacobs will make available the Hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluations and follow-up to all employees who have had an exposure incident.
- 10.2 The medical evaluations and procedures including the Hepatitis B vaccine, vaccination series, post-exposure evaluation and follow-up (including prophylaxis) will be made available at no cost to the employee. The evaluations and procedures will also be made available at a reasonable time and place, will be performed by or under the supervision of a licensed physician, and be provided according to recommendations of the U.S. Public Health Service. All laboratory tests will be conducted with an accredited laboratory at no cost to the employee.
- 10.3 If the employee chooses *not to accept* the vaccine, a Declination Statement should be obtained with the employee's signature (Appendix A). The statement is not a waiver. The employee reserves the right to receive the Hepatitis vaccination at a later date if they remain occupationally at risk for Hepatitis B.

## **11.0 HEALTHCARE PROFESSIONAL'S WRITTEN OPINION**

11.1 For each post-exposure evaluation, the Company shall provide to the affected employee, through the medical clinic, a written report concerning the physician's recommendations within 15 days of completion of evaluation including:

- 11.1.1 Whether a Hepatitis B vaccination is indicated for employee and medical conditions resulting from; the employee's ability to receive Hepatitis B vaccine and whether employee received such vaccination.
- 11.1.2 Any medical conditions resulting from exposure.
- 11.1.3 That the employee has been informed of the results of the evaluation and that the employee has been told of any medical conditions resulting from exposure requiring further evaluation.

## **12.0 RECORDKEEPING OF MEDICAL RECORDS**

12.1 The designated Jacobs Medical clinic shall maintain a confidential medical record for each exposed employee. The record shall include the following:

- 12.1.1 The employee's name and Social Security number.
- 12.1.2 A copy of the employee's HBV vaccination status including dates of all Hepatitis B vaccinations and any medical records concerning the employee's ability to receive HBV vaccination.
- 12.1.3 A copy of all results of examinations, medical testing, and follow-up procedures.
- 12.1.4 The employer's copy of the healthcare professional's written opinion.
- 12.1.5 A copy of the information provided the healthcare professional.

12.2 Jacobs will ensure that the employee medical records are kept confidential and not disclosed or reported without the employee's expressed written consent to any person within or outside the workplace, except as required by 29 CFR 1910.1030 or as may be required by law.

12.3 The records will be kept at least the duration of employment plus 30 years.

### 13.0 TRAINING

13.1 All emergency response personnel shall receive initial training and an annual refresher training on bloodborne pathogen exposure control. Training contents shall include:

- 13.1.1 Employees must be given access to a copy of the Bloodborne Pathogen Standard 1910.1030, and its contents must be explained to them.
- 13.1.2 There must be a general discussion of bloodborne diseases with special emphasis on the epidemiology, symptomatology, and modes of transmission of HIV and HBV.
- 13.1.3 There must be an explanation of Jacobs' Exposure Control Plan (SOP 7.6), and employees must be told how to obtain a copy of the written plan for their review.
- 13.1.4 An explanation of the methods of recognizing tasks and other activities that may involve exposure to blood or other potentially infectious materials.
- 13.1.5 An explanation of emergency response procedures that can be used to prevent or reduce exposure such as engineering controls, PPE, and work practices.
- 13.1.6 Information must be made available on the types, selection, proper use, location, removal, handling, decontamination, and disposal of PPE.
- 13.1.7 Information on the hepatitis B vaccine, its effect, safety, method of administration, benefits, and that it will be offered free of charge to all employees that have occupational health care responsibilities.
- 13.1.8 Appropriate actions to be taken in an exposure incident, including the method of reporting and the medical follow-up that will be available.
- 13.1.9 Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident.
- 13.1.10 Explanation of signs and labels required by Communications of Hazards.

- 13.1.11 An opportunity for interactive questions and answers with person conducting training session.

#### **14.0 TRAINING RECORDS**

- 14.1 Training records shall include the following information:

- 14.1.1 Dates of training session.
- 14.1.2 Contents or summary of training session.
- 14.1.3 Names and qualifications of person(s) conducting training.
- 14.1.4 Names and job titles of all persons attending training.

- 14.2 Training records shall be maintained for at least three years from the date training session occurred.



---

## Appendix A

The following statement of declination of hepatitis B vaccination must be signed by an employee who chooses **not to accept** the vaccine. The statement can only be signed by the employee following appropriate training regarding hepatitis B, hepatitis B vaccination, the efficacy, safety, method of administration, and benefits of vaccination, and that the vaccine and vaccination are provided free of charge to the employee. The statement is not a waiver; employees can request and receive the hepatitis B vaccination at a later date if they remain occupationally at risk for hepatitis B.

### Declination Statement

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

\_\_\_\_\_  
Employee Signature

\_\_\_\_\_  
Date

**Appendix I**  
**Safety Meeting Form**

**Safety Meeting Form  
Health and Safety Program  
Indian Mountain LRRS, Alaska**

NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:
NAME	SSN:

PRESENTED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

TOPICS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## **Appendix J**

### **Alaska Department of Fish and Game Division of Wildlife Conservation Bear Information and Guidance**

ALASKA DEPARTMENT OF FISH AND GAME  
DIVISION OF WILDLIFE CONSERVATION

March 1990

**POLICY FOR MANAGING BEAR/HUMAN CONFLICTS IN ALASKA**

**PURPOSE**

This departmental policy provides guidance to the Alaska Department of Fish and Game, Division of Wildlife Conservation for dealing with bear/human conflicts. The wide range of conditions in Alaska and circumstances leading to conflicts necessitate a flexible policy. The philosophy in these guidelines is to minimize human injury, loss of property, and unnecessary loss of bears, while maintaining the health of the bear populations throughout the state.

**BACKGROUND**

The Department of Fish and Game, Division of Wildlife Conservation is the state agency charged with managing black and brown/grizzly bears in the state. As such, the division is responsible for assuring sustainable populations of these species statewide. The department is also responsible for assisting the public in avoiding and dealing with bear/human conflicts.

Bears are abundant in Alaska, occurring throughout the state, including urban areas. As the human population of Alaska grows and expands farther into bear habitat, increased contact with bears will occur and the number of bears habituated to humans will increase. Circumstances will develop where action must be taken to alleviate real or perceived conflicts between bears and people.

In some areas, bear density is seasonally high, such as on salmon streams or in good berry feeding areas. These congregation sites require special management considerations to protect food resources important to bear populations and to minimize conflicts with human uses of these areas.

Two state regulations deal with bear/human conflicts. One prohibits the feeding of bears and other large predators or intentionally leaving human food or garbage in a manner that attracts these animals (5 AAC 92.230). The other defines a person's rights and responsibilities in defending himself or his property from wild animals (5 AAC 92.410). These regulations give the individual responsibility, guidance, and authority to deal with legitimate bear/human conflicts. In some instances, particularly those involving black bears for which hunting regulations are liberal, problem bears can oftentimes be taken under normal hunting regulations and it is the department's policy to promote such legal taking.

## RATIONALE

Incidental encounters occurring away from human habitation are the most common bear/human contacts. These are usually brief and do not develop into conflicts. Options for minimizing the frequency with which these encounters become serious conflicts include:

- (1) increase public education on bear behavior and how to deal with bears and garbage in the wild;
- (2) increase public information about areas of high bear density;
- (3) recommend that people avoid areas of high density or recommend that land managers temporarily prohibit public use of such areas; and
- (4) recommend that private or commercial land use development not be sited in areas of seasonally high bear concentrations.

Bear/human conflicts are most common where bears regularly acquire human food or garbage. The best way to prevent bears from becoming attracted to human food is to preclude access to these food sources. Once a bear is habituated to human food or garbage, options become limited, expensive, ineffective, and unacceptable to some members of the public. These options include:

- (1) rigorous garbage management policies and enforcement of regulations to deny bears access to human foods and garbage;
- (2) aversive conditioning to teach a bear to associate human food with discomfort;
- (3) translocation (moving a bear to a different location);
- (4) capture of a bear and confinement to a zoo; and
- (5) destruction of the "problem" bear.

Denying bears access to human food, garbage, or other attractants is by far the most effective and satisfactory method of minimizing bear/human conflicts. This is the preferred option.

Aversive conditioning means deterring a bear by using loud noises or by inflicting pain. Methods include sirens, cracker shells, rubber slugs, birdshot, and "thumper" projectiles. Chemicals for taste aversion and/or irritant properties may also be employed. To be effective on a habituated bear, aversive conditioning should be applied promptly and consistently. If possible, aversive conditioning should be preceded by removal of the food, garbage, or other reason that the bear was attracted initially.

Translocation is seldom an effective solution. Bears have a proven ability to return to home ranges from long distances and over rugged terrain. Those that do not return are likely to continue to be involved in bear/human conflicts in new locations. Translocation is often preferred by the public, but considering its demonstrated ineffectiveness, human safety concerns, and the high expense, it is generally inappropriate to spend time and funds on such efforts.

Removal to zoos is only occasionally a viable option. Few qualified facilities are willing to take bears from Alaska because they are easy to obtain, breed, and maintain in captivity. Rarely will zoos accept bears older than cubs. Capture can be difficult and expensive.

Killing the bear may be the only effective alternative once efforts to avoid a bear/human conflict have failed. Division personnel lack the time and resources to routinely kill bears involved in conflicts. Circumstances of time and distance usually require that such situations be handled by individuals on the scene. Alaska hunting regulations can generally accommodate these situations. Hunting regulations in the vicinity of problem areas may result in habituated bears being killed legally and used by the public; this is preferable to state or municipal agency personnel killing these bears. Bears habituated to human food are probably more vulnerable to hunters than other bears and they are often taken early in hunting seasons near human settlements. However, liberal hunting seasons are not specific to the individual bear(s) causing the conflict and the resulting increase in the harvest of non-target bears may reduce the area bear population more than is desired, so the effects of liberalized regulations should be considered before they are adopted. Liberal hunting seasons are inappropriate if the offending bear(s) include sows with cubs because these bears cannot be legally harvested by hunters. State law also prohibits legal harvest of brown bears within one-half mile of established landfills or dumps, so liberalized regulations may not be effective in reducing brown bears accustomed to feeding in these areas.

In cases where immediate danger to an individual or his property exists, offending bears may be killed by any individual under the provisions of the Defense of Life or Property (DLP) regulation. A person killing a bear under these circumstances is responsible for reporting the incident and salvaging the hide and skull.

### POLICY GUIDELINES

1. Management efforts will emphasize the prevention of bear/human conflicts. Staff will attempt to anticipate problems that may result from changing human use patterns in bear habitat and will recommend methods to minimize conflicts to land managers and local authorities. Public information efforts on avoiding bear conflicts will be employed.
2. Bears living in proximity to humans and feeding on natural foods will not be considered nuisance animals. If necessary for public safety, the public will be alerted to the presence of bears and, where feasible, efforts will be made to prevent access by bears to human food or garbage.
3. State, municipal, and corporate policies and regulations regarding food storage and garbage disposal should be rigorously enforced. If division staff become aware of violations, they should notify both the offender and the appropriate enforcement agency. The individual, agency, or corporation responsible for food or garbage stored in a manner that is "attractive" to bears, under the provisions of 5 AAC 92.230 and .410, should be warned or cited. If a bear is killed under DLP provisions, and the taking was brought about by improper disposal of garbage or a similar attractive nuisance [5 AAC 92.410(a)(1)], the offender will be warned or cited.
4. Non-lethal methods of deterrence should be used before other options are exercised if a new conflict situation develops. If a chronic bear/human conflict exists, aversive conditioning techniques will be employed only after all reasonable efforts have been made to remove or secure the source that may have caused the conflict. These techniques should begin as soon as possible and be employed as consistently as

possible. If staffing or funding limitations prohibit division staff from being directly involved in aversive conditioning, qualified staff from other agencies or private citizens may be used.

5. The division generally will not translocate bears involved in bear/human conflicts. Exceptions may be made in cases where bears are uncommon, where translocation funds are generated outside the division, and where acceptable release sites are identified. Translocated bears will be moved only to suitable remote habitat selected by the local area biologist. All translocated bears will be marked to facilitate future identification.
6. The division generally will not capture bears involved in bear/human conflicts for confinement in a zoo. Exceptions may be made if suitable zoo facilities are available and if the zoo is willing to pay for transportation costs for shipping the bear. Zoos must meet the standards and adhere to the policies set forth in the division's "Policy on Zoos" (August 18, 1989) prior to receiving bears. The division's headquarters office will be responsible for maintaining a list of qualified zoos willing to accept bears, and they will be contacted prior to capture.
7. Orphaned cubs will be left in the wild except in circumstances where qualified zoos are available to accept them. If there is no zoo to accept orphaned cubs and they are likely to become habituated adults or perish if left on their own (<6 months old for black bears or <1 year old for brown/grizzly bears), the cubs will be destroyed.
8. Where chronic bear/human conflicts exist and non-lethal options have failed, the problem bear(s) will be killed. Division personnel will kill the bears(s) only in cases where an immediate or recurring danger to the public exists.
9. In cases where immediate danger to an individual or his property exists, offending bears may be killed by any individual under the provisions of the DLP regulation (5 AAC 92.410).

Division staff, with assistance from the Department of Public Safety, will interview and obtain written statements from all individuals taking bears in DLP instances. Standard DLP report forms shall be used to report circumstances of the kill. Sealing certificates, DLP reports, and hides will be sent to the Regional Sealing Officer in Anchorage. Hides will be disposed of by public auction or provided to recognized scientific or educational institutions (a minimum \$200 handling fee will be charged) under provisions of scientific/educational permits. Skulls may be retained in the area office or disposed of to recognized scientific or educational institutions.

10. Division staff will not attempt to hunt and kill bears responsible for human maulings except in cases where the attack was unprovoked, the bear continues to pose an immediate threat to human safety, and the offending bear can be identified with a reasonable degree of certainty.



ALASKA DEPARTMENT OF FISH AND GAME  
DIVISION OF WILDLIFE CONSERVATION

March 1990

**POLICY ON SOLID WASTE MANAGEMENT AND BEARS IN ALASKA**

**INTRODUCTION**

Black (*Ursus americanus*) and brown/grizzly (*U. arctos*) bears are common or abundant throughout most of Alaska. Both omnivorous species quickly learn to seek out human food or garbage when provided the opportunity. Polar bears (*U. maritimus*) live in the sea ice environment of the Beaufort and Chukchi Seas and are sometimes attracted to human developments along the arctic coastline. Habituated bears are particularly dangerous and once habituated, generally must be destroyed. As state land disposals, resource development, community expansion, tourism, and outdoor recreation increase throughout Alaska, more bear-human conflicts will occur. Therefore, a consistent and enforceable departmental policy on solid waste management is necessary to minimize impacts on Alaska's bear resources as well as protect the safety of human residents. This policy addresses human settlements throughout Alaska; however, cities may have special problems that must be dealt with on a case-by-case basis.

**OBJECTIVES**

The objectives of this policy are to:

- (1) reduce garbage/bear interactions, thereby reducing bear/human confrontations which risk human injury or death or result in killing of "nuisance" bears;
- (2) provide consistent guidance for department responses to proposed human developments where solid waste and other attractants may affect bears; and
- (3) provide guidelines to other agencies on the solid waste management practices which should be required prior to issuance of permits under their jurisdictions.

**IMPLEMENTATION**

To achieve the above objectives, interagency cooperation among the Alaska Departments of Fish & Game (DF&G), Public Safety (DPS), Environmental Conservation (DEC), Natural Resources (DNR), Transportation and Public Facilities (DOT/PF), and the United States Forest Service (FS), National Marine Fisheries Service, Bureau of Land Management (BLM), National Park Service, U.S. Fish & Wildlife Service (FWS), private industry, and private land owners (e.g., Native corporations) will be necessary in developing plans and issuing, monitoring, and enforcing permits and regulations as well as providing public education. The prime elements to accomplish this effort will be:

- (1) solid waste disposal permits issued by DEC;

- (2) DNR, FS, NPS, FWS, and BLM administration of special-use permits for permitted facilities and general prohibitions concerning solid waste storage and disposal;
- (3) DF&G, DEC, and DPS regulations for proper storage, transport, and disposal of food, garbage, fish and game waste products, and other associated solid waste;
- (4) coordinated public education efforts by federal and state agencies involved in natural resource management in Alaska;
- (5) cooperation among agencies, interest groups, and the general public involved in management and use of Alaska's natural resources; and
- (6) effective private industry policies that prohibit employees and contractors from feeding bears or improperly disposing of attractants and that punish employees that violate this policy with immediate dismissal and refusal for rehire.

## GUIDELINES

Bears are attracted to human foodstuffs and garbage because they are easily obtained, occur in large quantities, and are often a nutritious food source. The most effective solution for handling bear problems is to eliminate the attractant from the bear's environment before a problem develops.

The following guidelines should be followed throughout Alaska where bears are or may be attracted to garbage.

1. Solid waste disposal sites for communities and permanent field camps should be located, if feasible, in habitats receiving the least use by bears. For example, traditional movement routes and seasonal concentration areas (such as salmon spawning streams or productive berry areas) should be avoided.
2. The preferred alternative for disposal of organic products that may attract bears is incineration in a facility that meets DEC standards for combustion residue (i.e., less than 5 percent unburned combustibles). In large urban communities or at regional disposal sites, daily landfill is an acceptable alternative to reduce or eliminate attraction by bears, provided that these facilities are secured by a bear-proof fence.

Existing open-pit sites that use surface burning for disposal should be phased out and replaced by a system of daily incineration meeting the above standards or by daily landfill.

3. Large (more than 15 people), permanent (more than one season) field camps should dispose of organic products by daily incineration in a fuel-fired incinerator that meets the above standards. Alternatively, organic products could be hauled daily to a DEC-approved regional disposal site. Temporary storage of organic products prior to incineration or backhaul should be in a bear-proof enclosure (building or fence).

These camps should be surrounded by a bear-proof fence. Alternatively, dining halls, kitchens, sleeping areas, and incinerators should be fenced, and no organic wastes allowed to be left in vehicles.

4. Small permanent facilities (e.g., lodges, weather stations) or large nonpermanent camps should daily segregate and store organic wastes, and items such as cans and jars that are contaminated with organic waste, in a bear-proof container for weekly backhaul to an approved disposal site. Alternatively, (a) organic waste and other combustibles could be incinerated in a locally-fabricated incinerator meeting DEC standards for residue, or (b) garbage grinders with disposal to a sewer system could be used to remove organic wastes, while contaminated combustible and noncombustible wastes could be incinerated or temporarily stored as above.
5. Food and organic wastes, if stored outside in bear habitat, should be stored in sealed bear-proof containers. Although it is not necessary to remove fish or game carcasses from the field, these should not be left at a central site nor should they be left in or near a campsite or other place with high potential for bear/human conflicts.
6. Small parties using Alaska's backcountry should burn all combustibles and pack out all noncombustibles. Organic material should not be discarded along trails. Caution and common sense are required to reduce or eliminate attractants to bears.
7. In all new parks, roadside facilities, and temporary construction worksites located in bear habitat, bear-proof garbage cans and regular garbage pickup should be required. This requirement should be phased into all existing facilities as soon as possible.
8. Baiting and feeding bears and other wild game by photographers, tourists, hunters, or others is prohibited except for trapping furbearers or hunting black bears consistent with regulations on black bear baiting [5 AAC 92].
9. Bears currently accustomed to eating garbage should be handled on a case-by-case basis according to DF&G's guidelines for managing bear/human conflicts.

## DEFINITIONS

Combustible: wood, paper, or plastic products which can be completely burned to ash with a normal fire (e.g., campfire).

Field camp: a field facility (including cabins, trailers, or tents) used for sleeping and feeding people (e.g., mines, logging camps, oil and mineral exploration camps, fish camps, lodges, research facilities, remote hatcheries, fish weirs, etc.).

Garbage: human refuse including paper and plastic products, glass, metal, aluminum, and a wide variety of organic food material.

Habituation: the process by which animals lose their natural fear of humans. Habituated bears may be extremely dangerous, especially when they associate people with food.

Organic products: all foods or edible plant and animal parts (e.g., meat, vegetables, bread, grain, apple cores, banana peels, lettuce, fish and game carcasses, etc.).

Sealed bear-proof container: a container sealed to prevent the escape of attractant odors; bear-proof by means of physical barrier or hanging out of reach (e.g., sealed aluminum containers, pulley system in a tree 15 ft above ground level).

# BEAR

## MODEL BD-100

### BEST ECOLOGICAL ALTERNATIVE ROUND

#### BEAR DETERRENT CARTRIDGE

#### SPECIFICATIONS

##### PHYSICAL DATA

Gauge	12 (18.5 MM)
Chamber Length	2 3/4" (70 MM)
Projectile	Molded Polyurethane

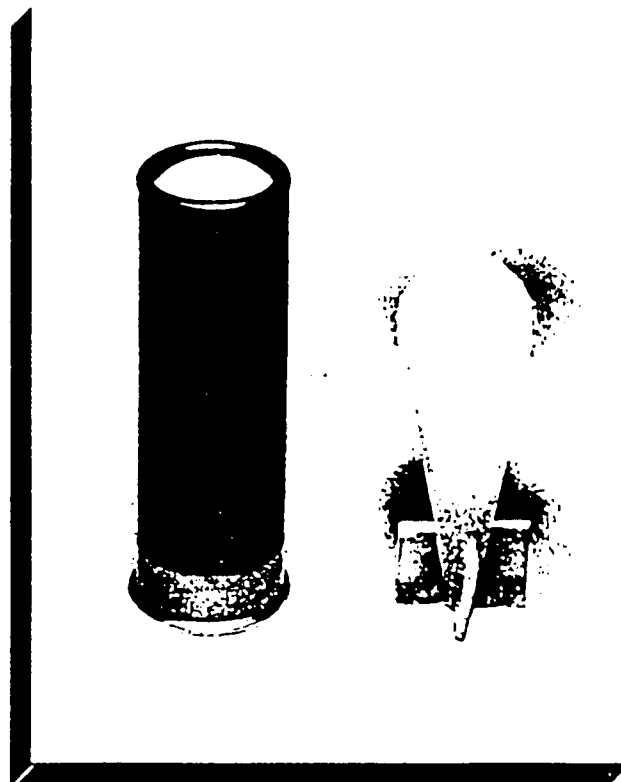
##### PERFORMANCE DATA

Velocity (Average)	
Muzzle	635 Ft/Sec (194 M/Sec)
54.7 Yds (50 M)	529 Ft/Sec (161 M/Sec)

Energy	
Muzzle	112 Ft/Lbs (152 J)
54.7 Yds (50 M)	78 Ft/Lbs (105 J)

Chamber Pressure	1440 PSI (9.93 MPa)
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Accuracy	
54.7 Yds (50 M)	90% Hits: 18 Inch (.46 M) Diameter



This round can be used in standard 12 ga. shotguns, without special attachment or device. However, it may *not* operate an autoloading gun, thus requiring manual operation of the action.

Under favorable conditions, the BD-100 will rid you of problem bears, without an injury or kill.

Some situations may require more than one hit on the bears rump or shoulder to be discouraged.

The user should maintain 40 to 50 yards standoff from the bear.

Always have a back-up armed with an appropriate gun for emergencies, as these rounds may *not* deter certain bears!

Be prepared for unexpected reactions from all bears!

WARNING MAY BE LETHAL. DO NOT SHOOT AT HUMAN BEINGS.

CARE AND SAFETY SHOULD BE USED WHEN FIRING THIS AMMUNITION.

TO BE USED IN 12 GA. SHOTGUNS ONLY, IN GOOD AND SAFE CONDITION: WITH CYLINDER OR IMPROVED CYLINDER CHOKE.

CHECK BORE FOR OBSTRUCTIONS BEFORE EACH SHOT.

DO NOT USE IN GUN WITH CHAMBER LENGTH LESS THAN 2 3/4".

NOT FOR USE IN TWIST OR DAMASCUS BARRELS.

USE ONLY IN GUNS FOR SMOKELESS POWDER.

MANUAL OPERATION OF MECHANISM MAY BE NECESSARY WHEN USED IN AUTOLOADING SHOTGUNS.

EFFECTIVE RANGE 50 METERS.

STORE COOL AND DRY.

# AAI

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## **SAFETY IN BEAR COUNTRY**

by

**Larry Van Daele**

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Division of Wildlife Conservation  
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Anchorage, Alaska 99518*

### **OBJECTIVES**

The primary objective of this presentation is to better acquaint people with bears, their life history, their behavior, and how humans fit into their lives. This information will help you make more rational decisions while you are in bear habitat and/or when you encounter a bear. Hopefully, you will then be in a better position to have a positive interaction with a bear, rather than being faced with a threatening situation. A better understanding should also give people a greater appreciation for bears and, hopefully, fewer bears will be destroyed as "nuisance" bears, or under the provisions of the state's defense of life or property provisions.

### **INTRODUCTION**

Since childhood we have been inundated with mixed signals about bears. On one hand we are thrilled and terrified with stories of bears mauling and eating people for little or no reason. These stories are reinforced by our instinctual fear of something that is bigger and more powerful than we are, and is capable of harming or killing fellow humans. Yet, on the other hand, we see trained bears in circuses and we watch television programs in which bears are cute, cuddly and kind. These bear images are reinforced by the stuffed "teddy bears" that offer companionship and security to millions of children. Unfortunately, neither of these extreme images accurately portray the truth about bears in their natural environment.

All of Alaska, including the urban areas, is bear country. Anytime we travel off the beaten path we have a responsibility to both the bears, and ourselves to behave in a knowledgeable and responsible manner. The more we understand about bears, the less we will fear the unknown. Once we overcome our "bearanoia", and think of bears as intelligent, wild animals that are potentially dangerous, but would usually rather be left alone, we can make rational decisions about how to avoid bear encounters and how to handle it if we do come face-to-face with them.

### **BEAR IDENTIFICATION**

Three species of bears live in Alaska: the black bear; the brown/grizzly bear; and, the polar bear. Because each of these species has a different life-style, and somewhat different behavior patterns, it is important to recognize what type of bear you are dealing with.

Black bear: Identification: Black bears are the smallest, and most abundant of the bear species in Alaska. They are about 5-6 feet long and stand about 2-3 feet high at the shoulders. They range from 200 to 500 pounds. While they are most commonly black, other color phases include brown (cinnamon), and rarely, gray (blue) and white. Muzzles are almost always brown. Black bears can be distinguished from brown bears by: 1) their head shape (a black bear's nose is straight in profile, a brown bear's is dished); 2) their claws (black bear's are curved and smaller, brown bears are relatively straight and larger); 3) their body shape (when standing, a black bear's rump seems to be higher than its shoulders; a brown bear's shoulders are usually higher than its rump); and, 4) by their ears (a black bear's ears are more prominent than a brown bear's ears).

Range: Black bears live throughout Alaska, except on the Kodiak Islands, the Alaska Peninsula, some islands, and the extreme northern and western portions of the state.

Typical Habitat: Black bears can occupy a wide range of habitats, but they seem to be most common in forested areas. Black bears are not uncommon in and around human settlements in Alaska.

Brown bear: Identification: Brown and grizzly bears are the same species. They can be over 8 feet long and stand 5 feet high at the shoulder. Weights are typically from 600 - 800 pounds, but can reach 1500 pounds. Colors range from blonde to dark brown. Coastal bears (referred to as brown bears) are the largest land carnivores and are usually medium to dark brown in color. Interior bears (referred to as grizzly bears) are smaller and usually have light tips on their hair, giving them a grizzled appearance. A brown bear's muzzle is the same color as its body. Cubs frequently have a white collar around their neck and shoulders. The dished-face and large shoulder hump are distinguishing features of the brown bear.

Range: Brown bears live throughout Alaska, except for the southern portion of the panhandle in southeastern Alaska, and on the Aleutians and some other islands. Biologists estimate that there are from 30,000 and 45,000 brown bears in the state, and in most areas the numbers are stable. Highest densities occur on Admiralty Island, the Kodiak Islands, and the Alaska Peninsula.

Typical Habitat: Brown bears can, and do, use virtually every type of habitat in the state. Although they are less common around human settlements than black bears, brown bears can live in close proximity to people.

Polar bear: Identification: Polar bears are about the same size as coastal brown bears. Colors range from white to yellow. Black nose is prominent. Head shape is similar to that of a black bear, but their long tapering necks make polar bears' heads appear to be small in relation to their body size.

Range: Coastal Alaska and offshore waters from Bristol Bay to the Arctic. Ice conditions dictate local polar bear abundance.

*Typical Habitat:* Islands, coastlines and waters near pack ice and ice-floes. Rarely occurring far inland, except for denning females.

## BEAR LIFE HISTORY

Although bears are often creatures of habit, they are also intelligent, and each has its own unique personality. The way a bear reacts is often dictated by what it has learned from its mother, the experiences it has had on its own, and, of course, the instincts that nature provided. So like other intelligent animals, such as dogs, we can make general statements about bears, but few people can accurately predict their behavior.

The most important sense organ for a bear is his nose. They have an incredible sense of smell, and they seem to trust it more than any other sense. Hearing and sight are also important, but to a lesser degree. A bear's hearing is probably better than ours, but not as keen as a dog's. Their sight is probably comparable to that of a human.

Both black and brown bears have similar life styles, although they do not usually get along with each other (brown bears will kill and eat black bears). Where both species occur in the same area, black bears tend to favor forested habitats while brown bears favor more open areas. Throughout the rest of this presentation we will deal with only black and brown bears. For most of us, the likelihood of encountering a polar bear is remote.

Bears are opportunists, relying on their intelligence and their senses to find food. They use differing habitats throughout the year, depending on the availability of food and other necessities of life. The amount of area a bear covers in a given year is partially dependent on how far it has to go to satisfy these basic needs. In some areas, such as Kodiak Island, individual bears have home ranges of less than a square mile. In other areas, home ranges can encompass hundreds of square miles. Males usually range over larger areas than do females.

In the spring, black and brown bears began coming out of their dens. Males are usually the first bears to emerge (usually in April), and females with new cubs are usually the last (sometimes as late as late June). When bears emerge from their dens, they are lethargic for the first few days, frequently sleeping near their dens and not eating. When they do start eating, they seek carrion (dead moose, caribou, sea mammals, deer, etc.), roots, and emerging vegetation. In coastal areas, beaches become travel corridors as bears seek these foods.

In the early summer, bears continue to eat new grasses and forbs as they develop in higher elevations. Moose and caribou calves are also important foods where they are available, and in some areas of Alaska bears and other predators kill significant numbers of these calves each year.

In areas where they are available, salmon are the most important food to bears from June through September. It is one of the few times that bears are found in large groups, and it is the time that most people see bears. Bears often travel, eat and sleep along streams for weeks at a time.

Other summer foods for bears include salmonberries, grasses, forbs, ground squirrels, and occasionally, adult moose and caribou. When bears kill or scavenge large prey they commonly cover the portions they cannot eat with sticks and duff. A bears may remain near a food cache for days and it will defend it from all intruders.

During the late summer and early fall, bears move inland and consume tremendous quantities of blueberries, elderberries, soapberries and other types of succulent fruits. As the seasons progress toward winter, a bear's diet becomes more varied. The last remaining berries and salmon are sought, as are live and hunter-killed moose, deer and caribou. This is the time that bears are trying to put on the final deposits of fat before their long winter naps.

In October and November, bears move into their denning areas and begin preparing a suitable den. Black bears usually den in holes excavated under large trees or rock outcrops, or in small natural cavities. Brown bears usually dig their dens in steep alpine areas. Dens are just large enough for the bears to squeeze into. Bears rarely eat, drink, urinate or defecate while they are denning. They sleep deeply, but do not truly hibernate, and they can be awakened by loud noises or disturbances.

Cubs are born in the den, usually in January. Black bear cubs usually stay with their mothers for a year and a half, and brown bear cubs usually stay with their mothers for 2.5 to 3.5 years. Black bears are sexually mature at age 2 and brown bears are sexually mature at age 4-8. Mating season is in the spring (May and June) and both species are polygamous (multiple mates). Both black and brown bears can live for 25 to 30 years, although most live less than 20 years.

#### BEAR/HUMAN INTERACTIONS

Given the choice, most bears would prefer to be left alone to pursue the finer things in life, like food and the opposite sex, but they share their homes with other creatures, including humans. We intrude on virtually every aspect of a bear's life. There are cabins, camps, airplanes, boats, cars, ORV's, fishermen, photographers, hunters, hikers, field workers, and on and on. Bears are normally pretty tolerant of these activities, and if they can find a secure way to avoid them, they will.

We can help the bears make a graceful retreat, and avoid many close encounters by letting them know we are around. Walking in groups, talking and wearing noise making devices such as bear bells all serve to warn a bear of your approach. Whenever possible, avoid hiking and camping in areas where bears are common, such as bear trails through heavy brush or along salmon streams. Keep an eye out for bears and bear sign. If you happen upon a dead animal, especially one that is covered with sticks and duff (a bear cache), immediately retreat (but don't run) the way you came and make a detour around the area. If you see a cub up a tree or a small bear walking by itself, again, immediately retreat and detour around the area. Like all young animals, cubs wander away from their mothers, but female bears are furiously protective when believe their cubs are threatened.



Even if we do everything possible to avoid meeting a bear, sometimes bears come to where we are. Bears are both intelligent and opportunistic, and they express these qualities through their curiosity. This curiosity frequently brings them into "human habitat". When this happens, we often feel vulnerable, and the bear is sometimes viewed as a threat or a nuisance.

In most cases, a curious bear will investigate "human sign", perhaps test it out (chew on a raft, scratch a door, bite into some cans, etc), and leave, never to return. Most people would regard this as a nuisance and they would have a good story to tell but it would be the end of the encounter. However, if the bear was rewarded during his investigation by finding something to eat, it could be a different story. Like dogs, it is easy for a bear to find food or garbage and keep coming back for it, but it is hard to stop them from doing it once they have been food-rewarded.

That is why we emphasize the importance of keeping human food and garbage away from bears. When in bear country, always think about the way you store, cook and dispose of your food. Never feed bears. This is both illegal and foolish. Food should be stored in air-tight containers, preferably away from living and sleeping areas. Garbage should be thoroughly incinerated as soon as possible and carried out. Fish and game should be cleaned well away from camp, and clothing that smells of fish, game or food should also be stored away from sleeping areas. Menstruating women should take extra precautions to keep themselves as clean as possible, and soiled tampons and pads should be treated as an other form of organic garbage.

Once a bear has obtained food from people, it may continue to frequent areas occupied by people. If a bear doesn't find any more food or garbage after the next few tries, it may give up and move back into a more natural feeding pattern. Occasionally, though, the bear will continue to seek human foods and can become a "problem bear". Some bears become bold enough to raid campsites and break into cabins in their search for human's food.

As we mentioned earlier, it is difficult to untrain a bear that has attained food from humans. The first step is to make sure that the food source is removed. The next move is to try convince the bear that it is not worth his time to attempt to get more human food. Shooting bears in the rump with cracker shells, flares, rubber bullets and bird shot are common methods of "adversive conditioning". These are also very dangerous techniques, because they may seriously injure a bear if not done properly and/or they may cause a bear to attack the shooter. None of these methods are fool-proof, and if the bear continues to be a problem, it is often killed.

People often ask biologists in the Department of Fish and Game to move problem bears out of their area. This technique has been tried time and again both here in Alaska and in other areas, and it is rarely successful. Like ducks and geese, bears seem to have a natural homing instinct, and even when they are moved hundreds of miles across rugged terrain, they usually return to where they started. Another concern with moving a problem bear is that while on its way home, a bear that is accustomed to getting food from humans may seek out "human habitat" and cause problems over a broad area. For all of these reasons, the Department of Fish and Game has a statewide policy recommending against moving problem bears.

## UNDERSTANDING BEAR ENCOUNTERS

Bears are basically solitary animals. The only times they are in the company of other bears is while they are in a family group (sows and cubs), during the mating season, and in areas where there is a lot of food (such as salmon streams and open dumps). Over the centuries, bears have developed a complex set of signals to communicate their concerns to other bears. During chance encounters or in food-related encounters, the primary message in this bear language is to say "stay away from me". That message is also punctuated with a more subtle message that says "I'm the toughest animal in the area and if you challenge me you'll be sorry" or it says "I know that you're tougher than I am, so I won't challenge your dominance". By expressing these messages through body-language and noises, bears can assert themselves, or retreat gracefully, without fighting. There is an obvious advantage to avoiding a fight when you are dealing with an animal as powerful as a bear. Consequently, it is to our advantage as humans to try to understand what a bear is telling us so that we can avoid killing a bear or being mauled by a bear.

The most important thing to remember throughout the following discussion of bear encounters is that we are making general statements about a complex situation. Every bear has its own individual personality and every bear/human encounter is different. The value of simplifying these encounters into a series of rules is that at least you'll have a better idea of what may be going on in a bear's mind, and how you may be able to defuse the situation.

*#1) Bear sees you, you don't know the bear is around* - This is the most common bear/human encounter. Given their choice, most bears avoid detection by people and will simply move away when they sense a human. Contrary to the horror stories we've all heard, bears are not hiding behind every bush, waiting to attack people.

*#2) You see a bear and it doesn't seem to know you are there* - Move away slowly. Avoid intercepting the bear if it is walking. If possible, detour around the bear. If the bear is close to you, stand where you are or back away slowly. Do not act threateningly toward the bear, it may know you are there but it has chosen to ignore you as long as you are not a threat.

*#3) You see the bear and the bear sees you* - Do not act threateningly, but let the bear know you are a human. Wave your arms slowly, talk in a calm voice, walk away slowly in a lateral direction, keeping an eye on the bear. Unless you are very close to a car or a building, never run from bears. In a bear's world, when something runs it is an open invitation to chase it. Like dogs, bears will chase a running object even if they have no previous intention of catching it. Bears can run as fast as a race horse, so humans don't have a chance of outrunning a bear.

*#4) You see the bear, the bear sees you and stands on its hind legs* - This means that the bear is seeking more information. Bears stand on their hind legs to get a better look, or smell, at something they are uncertain of. It's your cue to help it figure out what you are. Help the bear by waving your arms slowly and talking to it. In spite of all the snarling, standing,

stuffed bears we've all seen, standing is not a precursor to an attack. Bears do not attack on their hind legs. It's also important to remember that when a bear goes back down on all-fours from a standing position, it may come towards you a few steps. This is normal, and probably not an aggressive act.

#5) *The bear sees you, recognizes you as a human, but continues to come towards you slowly* - This may mean several different things, depending on the bear and the situation. It may mean that the bear does not see you as a threat, and just wants to get by you (especially if the bear is used to humans, as in a National Park); the bear wants to get food from you (if it has gotten food from people before); the bear may want to test your dominance (it views you as another bear); or, if it is a black bear it may be stalking you as food (a very rare occurrence). In all cases, your reaction should be to back off the trail slowly, stand abreast if you are in a group, talk loudly and/or use some sort of noise making device. If the bear continues to advance, you should stop. At this point it is important to give the bear the message that if he continues to advance it will cost him. Continue to make loud noises and present a large visual image to the bear (standing abreast, open your coat). In bear language, bears assert themselves by showing their size. If an adult brown bear continues to come at you, climbing 20' or higher up a tree may also be an option if one is next to you (remember, never run from bears). Keep in mind, though, brown bear cubs and black bears can climb trees and adult brown bears can reach 10-15 feet high.

#6) *The bear recognizes you as a human and acts nervous or aggressive* - When bears are nervous or stressed they can be extremely dangerous. This is when it's important to try to understand what is going on in the bear's mind. Nervous dogs bark and snarl. Nervous bears growl, woof, make popping sounds with their teeth, rock back and forth on their front legs, and often stand sideways to their opponent. A universal sign of a nervous bear is excessive salivation (sometimes it looks like they have white lips). When a bear shows any of these signs, stand where you are and talk in a calm voice. Do not try to imitate bear sounds, this may only serve to confuse and further agitate the bear. If you are in a group, stand abreast. If you have a weapon available be prepared to use it.

#7) *Bear charges* - If all of the other signals fail, a bear will charge. Surprisingly, however, most bear charges are just another form of their language and they do not end up making contact. The vast majority of these are "bluff charges", that is, the bears stop before making contact with their opponent. There are many different types of bluff charges ranging from a loping uncertain gait to a full blown charge. If a bear charges, stand still. If you have a weapon, take appropriate action, but remember, if a bear is wounded, a bluff charge may immediately turn into a real charge as the bear's mind shifts from an offensive mode to a defensive mode.

#8) *Bear attacks* - When all else fails, a bear may attack. Attacks may be preceded by all of the behaviors we have previously described or they may be sudden. Seemingly unprovoked attacks are often the result of a bear being surprised (and feeling threatened), a bear defending its food cache, or a female defending her cubs. When a bear attacks, it typically runs with its body low to the ground, legs are stiff, ears are flattened, hair on the nape of the neck is up and the bear moves in a fast, determined way. Front paws are often used to knock the opponent down and jaws are used to subdue it.

If you are attacked by a bear, your reaction depends on the type of bear that is attacking. If it is a black bear, fight vigorously, for your life may depend on it. Black bears have been known to view humans as prey, and if you struggle with the attacking black bear, it probably will go elsewhere for its meal. Brown bears are a completely different story. Brown bears attack because they feel threatened, and they will continue to press the attack until the threat has been neutralized. If you fight and struggle, the bear will continue to fight, and a human has little or no chance to defeat a brown bear in battle. If you roll into a ball, place your hands behind your neck, and lie still when you are attacked, a brown bear will no longer see you as a threat, and may stop the attack. Although it sounds foolish to play dead while being attacked by a bear, this has been proven time and again to be the best way to survive a brown bear attack. It should be noted, however, that if you fall down and play dead before a bear actually makes contact, the bear may come over to you and try to figure out what is going on.

Actual maulings by bears are very rare. Alaska has more bears than anywhere else in the world, and there are hundreds of thousands of people living, working and playing in these bears' back yard. Yet, since 1900, there have only been an average of about 2 people per year mauled by bears in the state, and very few of those instances have resulted in death.

#### WEAPONS FOR BEAR PROTECTION

As a last resort, a bear may have to be shot. When this is the only option, it will likely be in a situation that has a sudden onset. Therefore, it is important that you are familiar and comfortable with whatever weapon you decide to carry. Remember that if you wound a bear, you make the situation worse.

There is an on-going debate as to what is the best weapon to use for protection from bears. Here are just a few of the pros and cons for some of the more popular weapons:

**Pistols:** PROS - convenient to carry, always with the person, can be used in close quarters during an attack, rapid fire possible.  
CONS - very dangerous to humans (accidents), much practice needed to be proficient, may not be powerful enough to stop a large bear.

**Shotguns:** PROS - can be loaded with a variety of projectiles, effective at close range in brushy situations, rapid fire possible, easy to use.  
CONS - inaccurate and ineffective at medium to long range, heavy to carry, potentially dangerous to humans, may not be powerful enough to stop a large bear.

**Rifles:** PROS - very powerful calibers are available, accurate at both close and long range.  
CONS - much practice required for accuracy in an emergency situation, range of bullet makes it dangerous to humans for a long ways, heavy and awkward to carry, rapid-fire is difficult with bolt action rifles.

*Bear*

*Sprays:*   PROS - easy to carry and use, little risk of permanent damage to bears and humans, effective in many situations.  
              CONS - may change a false charge into a real charge, ineffective at ranges greater than 20', ineffective in windy conditions, dangerous if accidentally discharged in a closed area such as an aircraft cockpit.

There are also long discussions about where is the best place to shoot a charging bear. In reality, a person usually has little time to contemplate shot placement in a true bear attack. If you have a choice, its best to aim at the shoulder and chest area. Bear's skulls are very thick and covered with large muscles, so head shots may not be effective. Once you have made the decision to shoot a bear, you have a responsibility to finish the job you've started. Keep firing until you are out of bullets or you are absolutely positive the bear is dead. A wounded bear can be dangerous to you and anyone else who comes into the area.

Regardless of the weapon you choose, it is imperative that you realize that the most effective tool you have against an attacking bear is your brain. Although bears are intelligent animals, we are smarter and we can often think our way out of a bad situation if we try. We must never let the weapon we carry become a replacement for common sense.

#### LAWS CONCERNING BEAR/HUMAN INTERACTIONS

There are two regulations governing bear/human interactions in Alaska. The first prohibits feeding bears or leaving garbage that attracts them (5 AAC 92.230). The other sets the guidelines for taking a bear in defense of your life or property (DLP) (5 AAC 92.410). These DLP provisions specifically state that a bear cannot be killed legally if the problem is caused by the improper disposal of garbage or some other attractive nuisance, or if it is brought about by harassment or provocation of the animal, or an unreasonable invasion of its habitat. The regulation also defines what is considered "property". If a bear is killed under the DLP provisions, the hide and skull are the property of the state and must be turned over to Fish and Game as soon as possible. The person that shot the bear is also required to submit a written report on the incident within 15 days.

#### SUMMARY

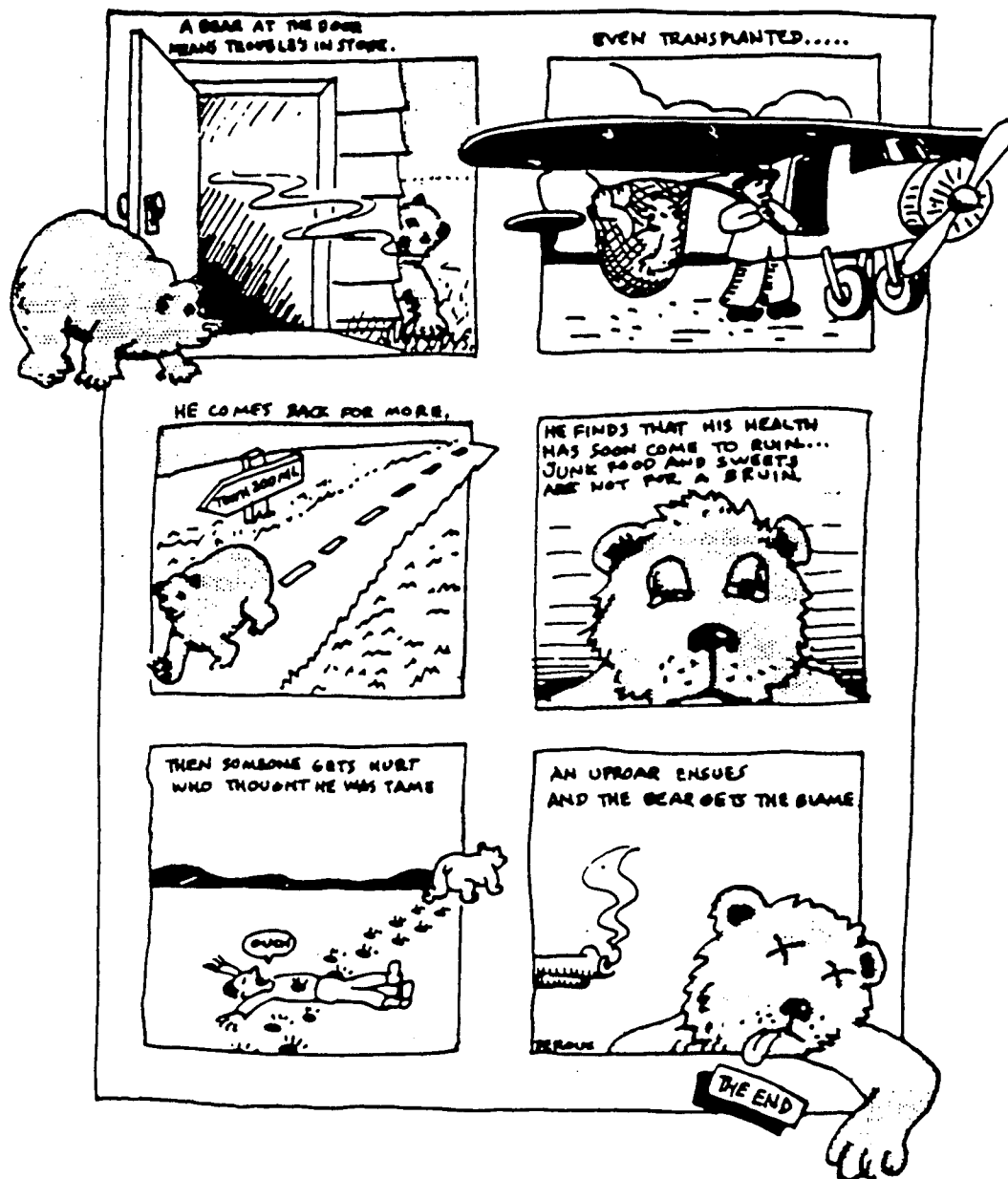
Bears are very intelligent, wild animals. They are neither man-eaters nor real-life stuffed animals waiting to be cuddled. People who live or work in bear country have a responsibility to themselves and to the bears to attain a greater understanding of bears, for it is only through such knowledge that we can allay our fears and better appreciate bears. This will, in turn, result in safer interactions for both humans and bears.

A few basic rules of thumb include: a) think of bears as large wild dogs; b) always keep food and garbage away from bears; c) try to avoid areas where bears are likely to be found and make noise when you are in areas where you are likely to encounter bears; d) if you encounter a bear, don't panic, try

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to understand the message the bear is conveying; e) never run from bears or imitate bear sounds; f) if a bear attacks, stand where you are - fight if its a black bear, play dead if its a brown bear; and, g) if you decide to carry a weapon in the field be proficient with it and know its limitations.

# IT MAY SEEM HARMLESS, BUT. . . .



By Dave Johnson  
Game Biologist  
Fairbanks

ON JULY FIRST, 1977, it became a misdemeanor to feed bears, foxes, wolves and wolverines in Alaska. Why a seemingly harmless act like feeding wildlife is now enough to put a person behind bars is the subject of this brochure.

Feeding wild carnivores can lead to a great photo-

graph, and some people regard it as a charitable thing to do, but the unfortunate truth is that although the photo may be exciting to show the folks back home, the peanut butter and jelly sandwich being eaten by the bear in the picture may actually lead to the bear's execution.\*

\*While this brochure deals largely with bears, much of the information is true for other species. For more information, read on.

Bears are intelligent creatures, and it doesn't take long for them to realize that if they walk up to a campground and look engaging, someone is bound to give them a handout. It sure beats digging up rotten logs and looking for grubs, even for a bear. That might not be so bad, but owing to the nature of both man and bruin, it's where problems just begin. Man has a tendency to be a bit pushy; indeed, one enterprising chap a few years ago tried to push a bear into his car so he could photograph the bear sitting behind the steering wheel beside his wife. Certainly Yogi Bear of the cartoon show would never have had the bad manners to maul the man, but then again, this bear wasn't a cartoon character. The bear's nature can be a problem too, in this situation at least. Sooner or later a bear will begin depending on the handouts as a primary food source. Chances are, the first time he attempts to eliminate the middleman and go straight to the food source, he's going to be shot. It's pretty hard to blame the cabin or home owner who shoots a bear when it's looking for food in his kitchen cupboards.

#### FEEDING BEARS WILL KILL THEM AS SURELY AS A RIFLE BULLET

The scenario is so familiar that the sequence of events can be predicted nearly every time. A bear learns about handouts, and for a while, they are gratefully accepted. One day the bear gets hungry enough to raid a cabin or threaten a human life, and it must be shot. In plain language, a person who feeds a bear its first handout must shoulder the blame, not necessarily the person who pulls the trigger.

Sometimes, a bear that becomes habituated to human food must be shot by biologists or protection officers before it becomes a menace to human safety. At best, that kind of a chore is distasteful for all concerned.

#### TRANSPLANTING BEARS DOESN'T SOLVE THE PROBLEM

It is often suggested that the Department of Fish and Game transplant problem bears to areas where they won't be able to bother humans. It doesn't work. We've tried it.

In the first place, bears have a well-developed ability to return to a former home. One Anchorage-area bruin transplanted to a roadless area more than 150 miles from the city was back in town in less than two weeks. Secondly, a transplanted problem is still a problem. Sooner or later a bear that has become used to human food will again come upon a human dwelling, and that's when the fireworks get started. The only real solution is never allowing these animals to become accustomed to human food.

#### ILLEGAL FEEDING INCLUDES MORE THAN SANDWICHES

According to the law, it is also illegal to leave human food or garbage in a manner that might attract hungry animals. Just because the fellow in the camper left his sandwich on a picnic table instead of handing it to the bear doesn't mean he can't be put in jail. Bears, like people, eat almost anything. Thus, improperly disposed garbage can be just as attractive, and just as illegal, as a nice, fresh sandwich.

#### FOXES, WOLVES AND WOLVERINES CAN BE PROBLEMS TOO

While the fox is scarcely the stereotype "heavy," he's sent more than one person to an untimely grave, especially in the days before the development of vaccine for rabies. Foxes are notorious for being afflicted with the disease, and the possible consequences of a rabid fox who has become used to handouts wandering into a campground can be readily imagined. The problem is compounded when food sources cause foxes to concentrate in one area, increasing the possibility of rabies being spread to many foxes and thus to humans. Wolves and wolverines sometimes carry rabies too, although not as frequently as foxes. And of course, any of these animals can inflict people with serious bodily damage if they so choose.

Although the problems stemming from feeding foxes, wolves and wolverines are largely public safety problems, wolves and wolverines are not necessarily welcome visitors at remote cabins. They too, are likely to be shot by the homeowner if they start making moves toward the kitchen. While the relationship is not as certain as with a bear, there's an excellent chance that feeding one of the other three will also lead to its death.

#### WHY THE REGULATION NOW?

The feeding of wild carnivores has become a serious problem in Alaska in recent years. More and more people are enjoying the outdoors, and given the number of bears and other carnivorous animals that inhabit the state, an increasing number of conflicts are inevitable.

In 1976 the problem reached new heights. Feeding wild animals had by then become a common sport for workers employed on the trans-Alaska pipeline, despite the sincere efforts of Alyeska Pipeline Service Company (the builder of the pipeline) to stop the practice. As a result, several of these animals had to be destroyed before they seriously injured or even killed any of the workers.

An emergency regulation went into effect during the summer of 1976 that made it illegal to feed these



animals along the pipeline construction corridor. Then, as the problems were not confined to pipeline construction camps, the Alaska Board of Game passed a new regulation early in 1977 which makes it illegal to feed bears, wolves, foxes and wolverines anywhere in the state.

### WE NEED YOUR HELP

Although fish and wildlife protection officers will apprehend many violators of this new regulation, they cannot be everywhere at once.

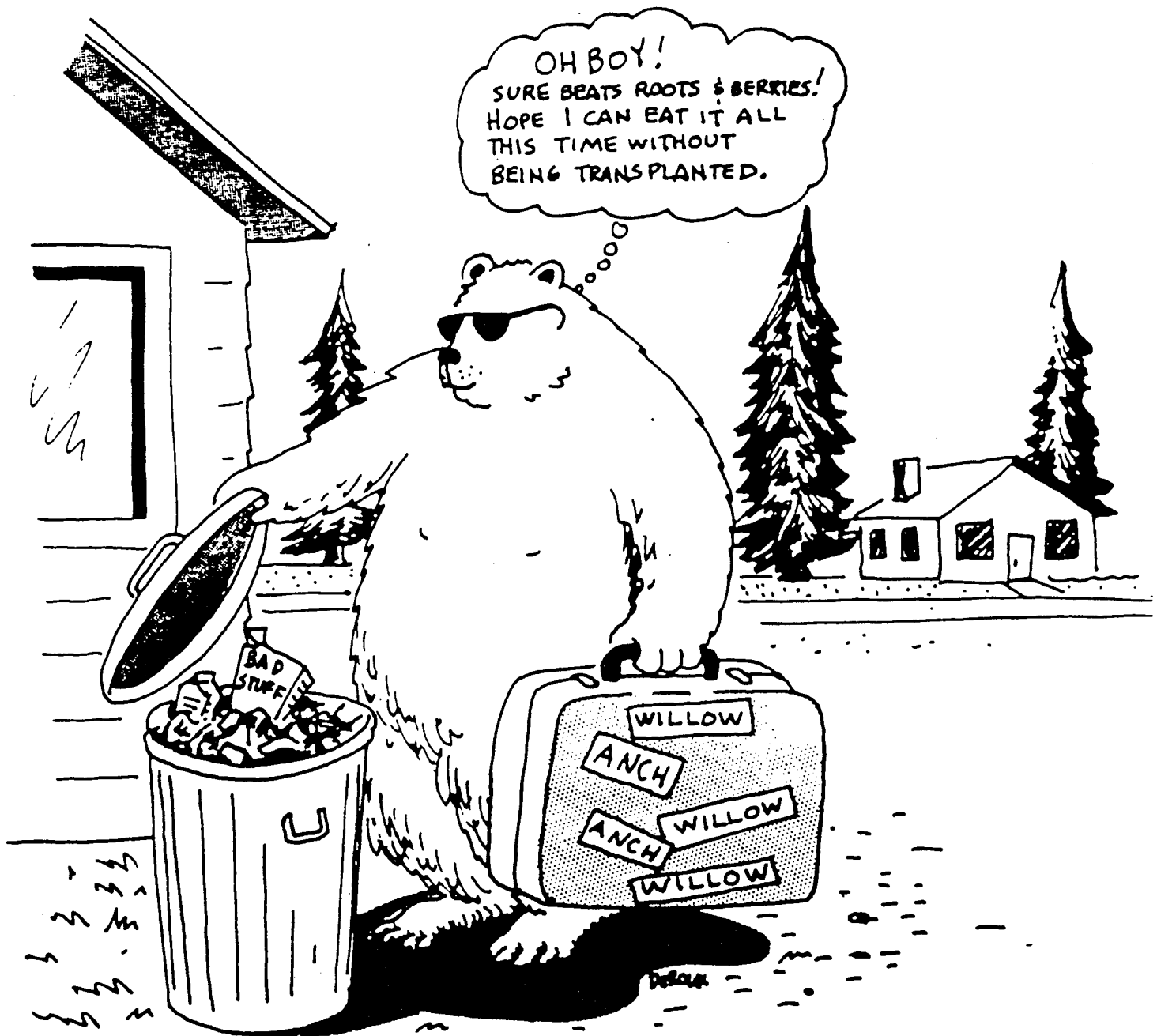
Many instances of illegal feeding may go unpunished unless you help. If you see a violation of this (or any other) wildlife law, note the vehicle license number and the description of the offender. If

possible, get his or her name, too. Note also exactly what happened, and where and when it occurred. If you can, find a witness and get his name, address and telephone number. (it will strengthen the case).

Report the incident as soon as you possibly can to the nearest Fish and Wildlife Protection or State Trooper office, or to the closest office of the Alaska Department of Fish and Game.

### EVERYONE IS IN THIS TOGETHER

Alaska's fish and wildlife represent a tremendous opportunity for enjoyment in many ways. Don't let others spoil it for us all by feeding these wild carnivores.



# Garbage Kills Bears



Alaska is bear country. No matter where we live in the state we're never far from bears. As Alaska's population has grown, we have moved into areas where bears have lived for thousands of years. We cannot expect bears to change. Our behavior must change if both bears and man are to live near each other.

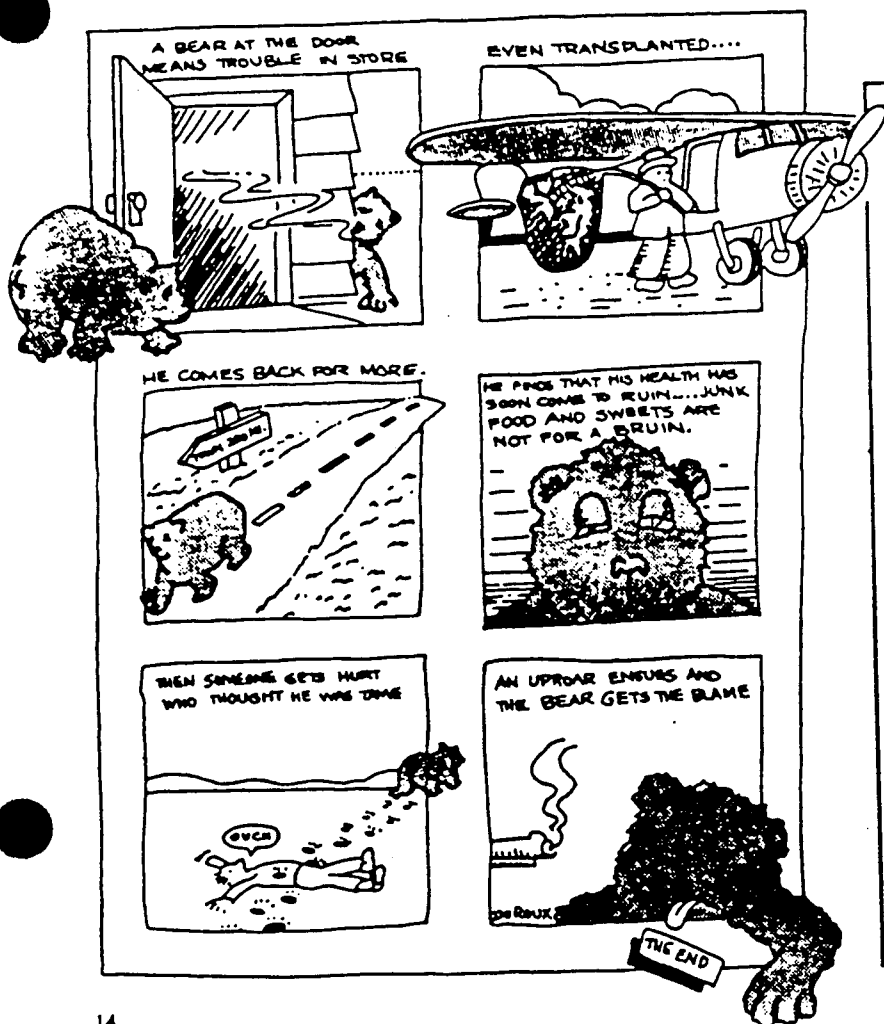
The law prohibits feeding bears in Alaska. Feeding includes both directly providing food and storing garbage in a manner which encourages bears to help themselves. Alaska's defense of life and property law permits the killing of a problem bear if "...the necessity for the (taking) is not brought about by the improper disposal of garbage or a similar attractive nuisance." Improper disposal of garbage may lead to fines and it may also lead to a bear's destruction.

Bears are intelligent creatures. It doesn't take them long to realize that an improperly maintained garbage can is an

easy source of food. The pattern of events is predictable. A bear feeds on garbage, and we enjoy the spectacle. After a few visits, the bear loses its fear of humans because the lure of the garbage is stronger than its natural aversion to man. When the bear no longer fears humans, it must be destroyed before it threatens a life. In plain language, the person who does not properly care for his or her garbage creates a situation which forces destruction of the bear.

Garbage bears are killed because it is the only honest option available. Transplanted bears often will return from great distances to their home territory, and those that don't return take their raiding habits with them to new areas.

We humans must accept responsibility for our trash. The only way people and bears can coexist in Alaska is if we care enough to keep bears from becoming accustomed to human foods and garbage.



## SAVE A BEAR Garbage Care Tips

1. Store garbage inside until pick-up day.
2. Take advantage of regular trash pick-up services. Don't stockpile your garbage.
3. Store garbage in tightly sealed bags; store fish parts and meat bones in freezer until garbage pick-up day.
4. Keep storage containers air tight and odor free.
5. Properly incinerate all garbage.
6. Properly incinerate and/or pack out all garbage from campsites and picnic areas.

Intentionally or knowingly feeding a bear is against state law.

gourmet dining when he finds it.

Thousands of tourists from the far reaches of the world disembark in Juneau and after oohing and ahing the sights of the downtown capital city, some large groups bus up to Silverbow Basin to dine on baked salmon. Here they gaze in wonder at the snow-covered peaks and ancient prospect holes and tumble-down ruins of the mining era on the mountains around them.

One evening this past summer a goodly crowd was eating salmon, sipping beer, and listening to music. Suddenly a diner looked up on the cliff above and spotted a huge black form moving out onto the tip of a ledge. The bear paused and sat down. It raised its muzzle and seemed to be inhaling the scent of cooking fish. He then tilted forward and seemed to be studying the merrymakers with amusement. Very shortly he was joined by two more bruins. They all sat down and it was hard to say who was having the greatest enjoyment—bears or tourists.

As many Juneau homeowners have found out, however, bears which become inured to man's presence are hard to discourage. They will continue to visit all summer right up to denning time. No bear is predictable and bears which lose their fear of humans are potentially dangerous. The summers of 1986-87 have been disastrous for bears, with a total of 14 having been shot by law enforcement agents in densely populated areas.

There is only one solution to ridding the area of a garbage bear and unfortunately that means killing the animal. The costly procedure of capturing and flying the beast miles away is only a stopgap measure as there have been cases where transplanted bears have shown up at the same dump only days after being deported.

The capital city has been infested with the shaggy black beasts the past couple of years. One householder in the Highland area on the side of Mt. Juneau heard a noise in the hallway. Peering out of the living room, she saw a furry black body bound down the hallway and disappear out the back door.

One persistent critter visited and revisited the Hansen household. One even-

ing Heather Hansen heard the bear shuffling about on the porch. After putting up with the persistent beast for weeks, she had had enough. Hearing him pad up to the door, she burst out and belted the intruder over the nose with a broom. The startled bear turned and raced away and never returned.

One night this past summer a lone patrolman from the Juneau Police Department was walking about in the early morning hours packing a gun with rubber bullets to discourage a garbage bear that happened to be at large. A resident of a nearby condo awakened to the clatter of garbage cans, bolted out of bed, and raised his window. Leaning out he bellowed, "Get out of there, you \*\*\*\*\*!" At this, the bear raced away full tilt up the street and around the corner. Unfortunately, the voice in the night had startled the officer also, and he, too, broke into a run. Guess what he met at the corner of the building? The bear flattened the policeman, ran over him without slackening his speed and vanished up the wooded slopes. The policeman sat up, dusted himself off, collected his cap, and resumed his lonely beat. I think his philosophy now is, "Grin and bear it."

My friend John Nielsen has a dog named "Grevy" which senses a bear's presence or, more likely, scents them. Recently the dog began to bark and stare right at John and his companion who in turn looked up at the forest and could not spot a bear. They had almost decided it was a false alarm when John caught a movement in the weeds in front and between him and his neighbor. There was a small bear sitting down just a few feet away looking about in a quizzical way.

This wasn't the first bear John had encountered during the summer. A few weeks before, he was alerted by his dog's bear bark and went out to investigate. Looking about he could not spot any bears. Then, as he turned back to the house, he spotted a bear's rear end protruding out of his burn barrel. Picking up a handy rock he whaled it against the metal drum. Immediately a scrawny bear backed out of the barrel and gave him a dirty look as if to say, "Can't you leave a fellow eat in peace?"

The funniest thing I ever saw involving a black bear happened on the back side of Douglas Island across Gastineau Channel from the capital city.

It was a lovely fall day and I was accompanied by Frank Rylak and my son Ray. We had topped out on the knife-edged spine of rock dividing the island. Once we descended the steep backside, we were in the spongy bogs known as muskeg. Full of wild flowers, fragrant Hudson Bay tea, moss and shore pine, the brushy draws often harbor deer. Since we were hunting Sitka black-tails, we concealed ourselves and I began to call.

The first squeals had scarcely died on the autumn air when I heard the thump of a heavy body and the soggy moss underfoot began to tremble. Then a huge black bear came thundering around a nearby bull pine. He was a magnificent black boar. Layers of fat rolled beneath his jet colored pelt which glistened in the morning sun.

On he came until he was a scant 75 feet away. Out of the corner of my eye I could see Frank with gun to shoulder glancing sideways to see what I was going to do. I certainly had no use for a 300 pound bear five miles from any transportation.

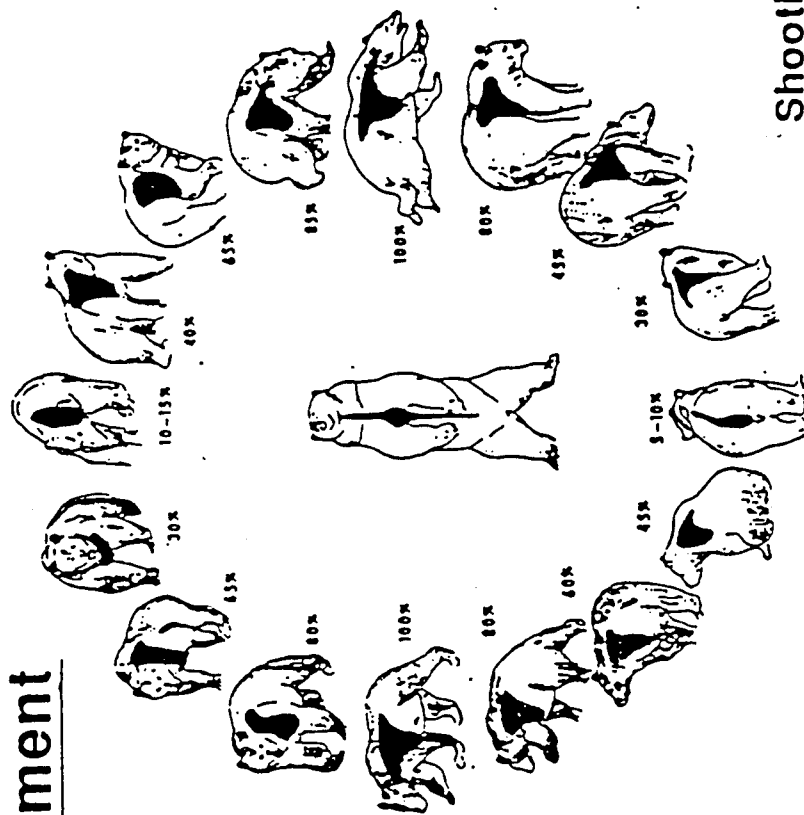
At the last possible moment I took a step forward and bellowed at the top of my lungs, "Where the blankety blank do you think you're going, you so and so?"

At my voice, the bear sat down while running full tilt. As his ample rump hit the bog, he braced himself to slow his skid, throwing up a roostertail from the squishy moss. When the blackie finally came to a halt, he was only 20 feet away. He gave me a disgusted look that said, "You sure don't look like a deer to me."

Then he wheeled and hightailed it into the brush. I'm sure the unhappy householders who are plagued by the bears of summer wish their unwelcome guests would leave so easily.

*Robert L. Parish, a freelance writer and artist who lives in Tenakee Springs, AK, is the author of Alaska: Where Only the Tough Survive. He is a regular contributor to this column.*

# Bear Shot Placement



## Shooting Angles

The figure next to the Bear indicates roughly the amount of vital area exposed at various angles.

Exposure of vital areas depends on the angle at which the Bear is turned toward the hunter. Broadside is the best possible angle with most (100%) of vital area exposed. Aim at the center of the shoulder!

# Bear Guns

Story and photos by William R. Meehan and John F. Thilenius, USFS

Excerpted and summarized from USDA Forest Service General Technical Report PNW-152, Safety in Bear Country: Protective Measures and Bullet Performance at Short Range.

**T**he brown bear is a fascinating animal, and seeing one at close range can be one of the most exciting outdoor experiences you can have. A mutual withdrawal is the preferred outcome of such an encounter, but that may not always be possible. The bear is large, fast-moving, and unpredictable in its response to humans. It is a potential hazard to outdoorsmen and those who work in bear country.

Most governmental agencies whose workers spend time in the bush require that at least one member of each work party carry a rifle or shotgun for bear protection. Both the U.S. Forest Service and the Alaska Department of Fish and Game, for example, have such policies. Most experienced outdoorsmen also carry weapons whenever they enter the habitat of *Ursus arctos*.

Debate has often centered on which cartridges provide the best protection. Much has been written about the performance of various cartridges and bullets on big game animals, but these tests are conducted at ranges from 50 to 300 yards or more. Little information is available on the performance of cartridges and bullets at ranges that could be considered critical in an encounter with a hostile bear. Distances greater than 15 or 20 yards probably do not constitute a dangerous situation, because other means of avoiding conflict remain open.

In a study we conducted recently, we evaluated commonly used and readily available cartridges and weapons at short range. We selected a distance of 15 yards as the "point of no return," the distance at which an obviously aggressive bear must be stopped or the person risks injury or death. By an obviously aggressive bear, we mean one that is charging with the assumed intent of doing bodily harm.

We built an open-ended wooden box to hold packets containing a silt and sawdust mixture recommended from previous gun tests. After each shot, we located the bullet by lifting the packets and removing the mixture until we uncovered the bullet. We measured its location to the nearest half inch.

We tested different cartridges, bullet weights, and barrel length combinations in four ballistic categories: striking energy, penetration, retained bullet weight, and bullet expansion. We measured bullet velocity because energy is a function of bullet weight and velocity. We also determined the free recoil energy, because, although not directly involved in short-range ballistics, it is nevertheless significant. Some shooters may become more fearful of the known effect of a heavy recoil than they are of the unknown effect of a charging bear.

Because we had no unbiased way to determine the relative importance of each ballistic category, we considered each to be equally important. The results of the test are contained in the table on page 33. The use of brand names does not signify endorsement or approval. We tested a wide range of weapons, in-

cluding those used by government agencies. Ammunition was chosen solely on the basis of availability.

Alaskans spend hours debating which weapon best for protection against brown bears, so the U.S. Forest Service decided to find out. They tested various guns and ammunition at close range and ranked them. The results will discourage people who carry large-caliber handguns as the primary weapon.



cluding those used by government agencies. Ammunition was chosen solely on the basis of availability.

No well-defined distinction exists between combinations of weapon and ammunition that are adequate or inadequate for protection against bears. The final decision must be made by each individual and should include consideration of weapon size and weight, recoil, and the person's experience with firearms. Our data can, however, be used as a general guide to the effectiveness at close range of these weapons and ammunition.

A rifle in the .375 magnum caliber in the hands of a person who can comfortably tolerate the recoil is a better choice than a .30-06. A .30-06 with 220-grain bullets, however, might be a better choice for a person sensitive to recoil, who may shoot a lighter caliber weapon with more confidence and accuracy.

Based on our tests, four cartridge-bullet combinations appear superior for protection against bears:

- .458 magnum, 510-gr soft-point bullet. For a shooter who can handle the recoil of this cartridge, a bolt-action rifle in this caliber is the surest weapon available.

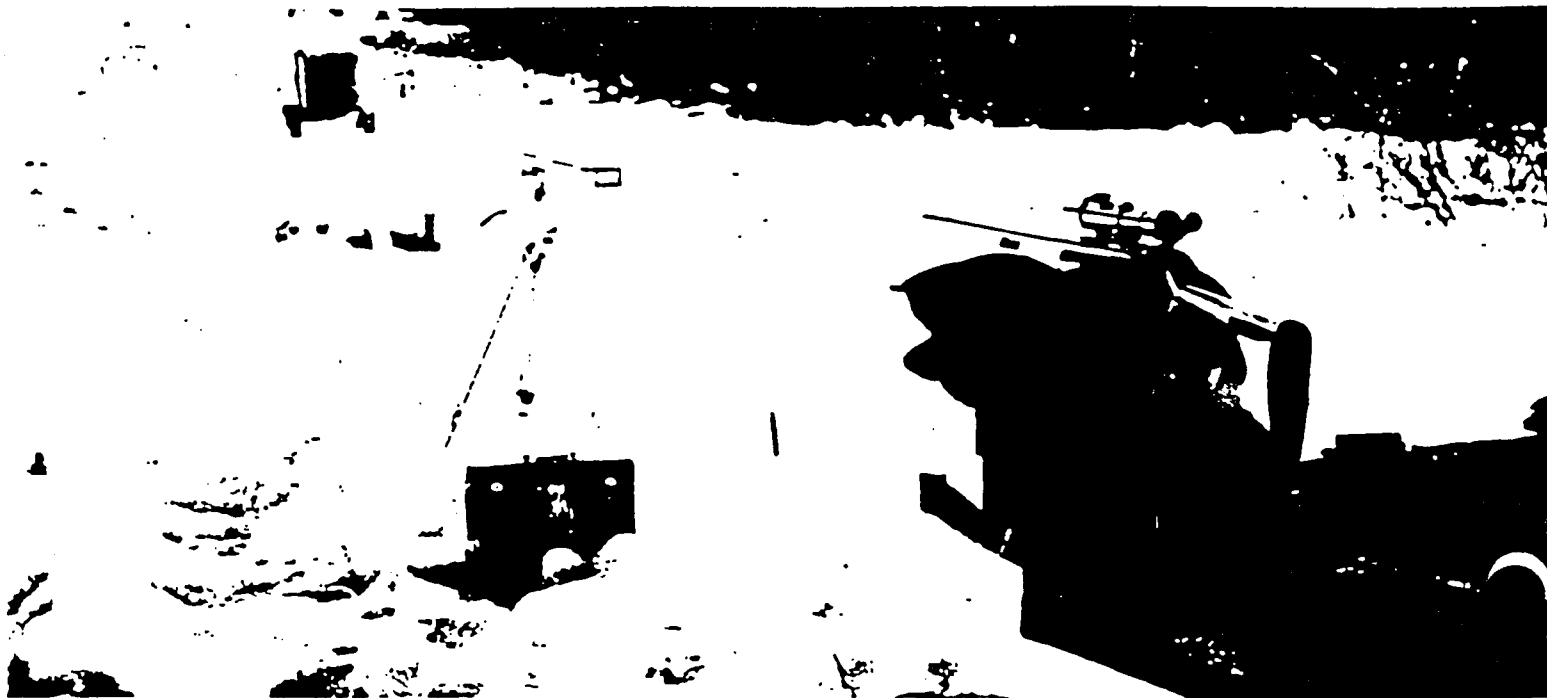
- .375 magnum, 300-gr soft-point bullet. The recoil of a rifle in this caliber, although considerably less than that of the .458 magnum, is still severe for many people. Our tests indicate that the 270-gr soft-point bullet in this caliber is only slightly less effective than the 300-gr bullet and has only slightly less recoil.

- .338 magnum, 300-gr bullet. This combination appears to be a good choice. Recoil is somewhat less than that of the .375

magnum, and our tests indicated that the effectiveness is nearly comparable. If the 300-gr bullet cannot be obtained, the 200-gr bullet should be used.

- .30-06, 220-gr bullet. Mild recoil, compared with that of the large- and medium-bore cartridges, makes this a strong contender for shooters who are sensitive to recoil. The .30-06 also has other advantages. It can be found in several actions—bolt, pump, semi-automatic—and can be obtained as or customized

tion of bullets shot at short range and can be used to compare different cartridges and bullets. Two major points can be inferred from our tests: 1, none of the many different types of bullets tested was completely adequate, and 2, high striking velocities may not be particularly beneficial at short range. The best results were from bullets relatively heavy for their caliber fired at moderate velocity. Many experienced people have also observed this; we have verified their observations under con-



into a short, handy, lightweight weapon.

We also tested various handguns, and the .44 magnum came out on top. Compared to rifles, it was similar in performance to the 8mm magnum 220-gr bullet and the .300 magnum 180-gr bullet, two of the lowest scoring combinations we tested. The superiority of the .44 magnum handgun makes it a good choice for a backup weapon. A revolver using this cartridge, however, should not be considered a primary weapon for protection from bears.

Only slight differences in ballistics were noted between .44's with long and short barrel lengths, but a short-barrelled revolver is lighter and easier to carry and draw.

Although shotguns are popular for bear protection, they did not fare well in our tests because of their low striking energy and the lack of bullet expansion. The lack of bullet expansion is somewhat misleading, because the slug is quite large to begin with. Shotguns with slugs are superior to shotguns with buckshot. We even question whether 00 buckshot would be lethal to a bear at distances beyond 5 yards.

Our tests of the performance of bullets at short range were conducted by shooting into a uniform test medium, not into brown bears. The medium did not have a thick coat of hair, resilient skin, dense muscle tissue, or heavy bones, and it was not angry and excited. Therefore, the validity of the tests may not be directly applicable to a real situation involving a bear.

Nevertheless, we believe the tests were a good relative evalua-

trolled conditions.

When shooting a bear, the shooter assumes the responsibility for making a quick kill. There should be no desire to hurt the bear, only to avoid being hurt oneself.

The most important shot is the first one. If not properly placed, it may also be the last shot. If a bear goes down on the first shot, continue to fire, aiming at vital areas until the bear stays down and is still. A bear that is hit and flees is extremely dangerous. The shooter has a moral responsibility to find and kill the wounded bear. Following a wounded brown bear in dense, poorly lighted forests is an experience most of us would like to avoid.

Although the State of Alaska allows bears or other wild animals to be killed to protect life or property, the dead bear is the property of the state. The hide, with feet attached, and the skull must be removed and turned over to the Department of Fish and Game, or the shooter is liable to prosecution and fines. The state will investigate the kill to determine whether a real necessity existed. No part of the bear may be kept. ■

*Bill Meehan and John Thilenius work at the Forestry Sciences Laboratory of the US Forest Service in Juneau. Mr. Meehan, a former employee of ADF&G, holds a Ph.D. in fisheries and wildlife from Michigan State University. Mr. Thilenius holds a Ph.D. in plant ecology from Oregon State University. The results of their study are in the table on page 33.*

# Bear Guns *Continued from page 17.*

Table 1 — Short-range ballistic performance

Cartridge	Ranking		Bullet			Ballistic performance					Firearm		
	Score	Rank	Weight	Type	Brand	Velocity, 15 yd	Energy, 15 yd	Penetra- tion	Retained weight	Expan- sion ratio	Recoil	Weight	Barrel length
			Grains			Ft/s	Ft-lb	Inches	Percent	Times	Ft-lb	Lb	Inches
<b>Rifle</b>													
458 Win Mag.	538	1	510	RSP	W-W	2074	4871	19.0	82	4.6	54.7	9.4	24
460 Wby Mag	487	2	500	RSP	WBY	2364	6204	17.2	65	3.8	76.8	10.7	26
375 H & H Mag (L)	301	3	300	SSP	W-W	2541	4903	16.8	67	4.0	41.1	8.6	24
338 Win Mag (S)	260	4	300	RSP	W-W	2314	3568	16.2	61	4.8	35.6	7.4	20
375 H & H Mag (L)	239	5	270	RSP	R-P	2659	4241	14.2	64	4.0	37.2	8.6	24
338 Win Mag (S)	213	6	200	PSP	W-W	2699	3235	15.0	69	4.2	28.9	7.4	20
338 Win Mag (S)	197	7	250	SSP	W-W	2507	3491	12.2	57	5.3	33.4	7.4	20
338 Win Mag (L)	191	8	200	PSP	W-W	2834	3563	12.3	60	4.7	26.0	8.6	24
338 Win Mag (L)	186	9	300	RSP	W-W	2360	3710	16.8	57	3.4	31.2	8.6	24
375 H & H Mag (S)	185	10	300	SSP	W-W	2401	3843	13.8	63	3.6	44.1	7.2	20.5
30-06 U.S.	157	11	220	RSP	R-P	2261	2498	17.7	65	3.6	15.3	8.8	22
30-06 U.S.	153	12	180	RSP	R-P	2456	2411	13.2	71	4.4	14.8	8.8	22
444 Marlin	146	13	240	FSP	R-P	2237	2668	11.0	72	4.5	27.6	7.3	22
358 Winchester	142	14	200	SSP	W-W	2366	2488	12.0	71	4.4	33.4	7.4	22
7 mm Rem Mag	141	15	175	PSP	W-W	2709	2853	13.0	44	5.6	18.5	9.1	24
375 H & H Mag (S)	137	16	270	RSP	R-P	2456	3735	12.3	50	3.9	39.4	7.2	20.5
45-70 U.S. (S)	133	17	300	HSP	FED	1573	1649	13.0	84	4.8	15.6	7.1	20
308 Winchester	128	18	180	RSP	FED	2430	2360	12.7	73	3.9	13.6	8.4	22
45-70 U.S. (L)	124	19	300	HSP	FED	1666	1849	11.0	96	4.1	18.6	7.8	22
358 Norma Mag	115	20	250	PSP	NOR	2730	4139	15.2	41	2.9	25.0	8.4	24
8 mm Rem Mag	107	21	185	PSP	R-P	2991	3676	10.7	32	5.5	29.1	9.4	24
300 Wby Mag	104	22	180	PSP	WBY	3033	3678	15.2	46	2.6	28.0	9.6	24
338 Win Mag (L)	100	23	250	SSP	W-W	2594	3735	14.7	45	2.6	30.0	8.6	24
350 Rem Mag	93	24	200	SSP	R-P	2568	2931	12.2	52	3.2	34.5	6.4	18.5
7x57 mm Mauser	87	25	175	RSP	FED	2419	2274	13.8	52	3.6	12.7	8.9	24
12-ga x 2 1/2 inch	74	26	438	LRN	FED	1398	1902	15.3	96	1.7	26.1	7.1	20
45-70 U.S. (L)	65	27	405	RSP	R-P	1322	1572	15.8	93	2.1	17.7	7.8	22
300 Win Mag	60	28	200	PSP	FED	2699	3237	15.2	36	2.2	25.9	7.8	24
300 Wby Mag	59	29	220	RSP	WBY	2798	3826	15.2	34	2.0	30.8	9.6	24
45-70 U.S. (S)	50	30	405	RSP	R-P	1211	1319	17.8	98	1.4	13.6	7.1	20
8 mm Rem Mag	49	31	220	PSP	R-P	2779	3773	12.8	28	2.5	18.9	9.4	24
44 Rem Mag (L)	47	32	240	LGC	R-P	1401	1046	11.5	97	2.6	13.9	3.1	7.5
300 Win Mag	44	33	180	PSP	FED	2959	3268	10.3	30	2.8	26.3	7.8	24
<b>Handgun</b>													
44 Rem Mag (L)	77	1	240	LGC	R-P	1401	1046	11.5	97	2.6	13.9	3.1	7.5
44 Rem Mag (M)	64	2	240	LGC	R-P	1317	925	12.2	97	2.3	14.1	3.2	6.5
44 Rem Mag (L)	63	3	240	JSP	W-W	1383	1019	14.5	94	1.8	12.4	3.1	7.5
44 Rem Mag (S)	60	4	240	LGC	R-P	1265	853	11.3	97	2.5	15.8	2.9	5
44 Rem Mag (S)	59	5	240	JSP	W-W	1370	1001	9.5	97	2.5	15.1	2.9	5
44 Rem Mag (M)	57	6	240	JSP	W-W	1348	969	11.5	96	2.2	16.4	3.2	6.5
357 S&W Mag	27	7	158	JSP	CCI	1226	528	9.5	99	2.1	7.2	2.3	4
45 Colt (L)	13	8	255	LRN	W-W	825	386	14.3	98	1.0	5.9	2.6	7.5
45 Auto	12	9	230	SMJ	R-P	819	343	14.2	100	1.0	5.2	2.4	5
41 Rem Mag	11	10	210	LFN	R-P	952	423	10.5	97	1.0	6.0	2.4	4.8
45 Colt	11	11	225	LHP	FED	813	330	13.3	97	1.0	4.6	2.6	7.5
45 Colt (S)	10	12	255	LRN	W-W	796	359	11.8	97	1.0	5.9	2.4	4.8
44 S&W Spec	9	13	246	LRN	W-W	745	303	12.1	99	1.0	3.9	3.1	7.5

— RSP = round nose soft point, SSP = semipointed soft point, PSP = pointed soft point, FSP = flat nose soft point, HSP = hollow soft point, LRN = lead round nose, LGC = lead gas-check, JSP = jacketed soft point, SMJ = solid metal jacket, LFN = lead flat nose, LHP = lead hollowpoint

— W-W = Winchester-Western, R-P = Remington-Peters, FED = Federal, WBY = Weatherby, NOR = Norma, CCI = Speer

— All rifles except 1 shotgun and 1 handgun included for comparison

— L = long barrel, M = medium barrel, S = short barrel; applies only when the same cartridge was tested in different length barrels.

— Score calculated on same basis as rifles and shotgun

— Score calculated for handguns only; not equal to rifle scores.

**Appendix K**  
**A Defense of Life or Property/Non-Hunting Bear Kill Reporting Form**



# DEFENSE OF LIFE OR PROPERTY/NON-HUNTING BEAR KILL REPORTING FORM



Please return to:  
ALASKA DEPARTMENT OF FISH AND GAME  
DIVISION OF WILDLIFE CONSERVATION  
333 Raspberry Rd, Anchorage, AK 99518-1599

State law (5ACC 92.410(b)) requires that any person who kills a brown/grizzly bear or black bear in defense of life or property (DLP) must submit a written report to the department within 15 days of the incident. This document can be used to satisfy that requirement.

If possible, this document should be completed by the person who killed the bear. If that person cannot complete the questionnaire the department agent receiving a report of a bear taken for DLP purposes should complete the questionnaire with information obtained from someone personally familiar with the circumstances of the kill.

Data from this questionnaire are compiled by the Department of Fish and Game. Your answers will help the department understand why people and bears have confrontations and how these conflicts can be minimized.

Information on the person filling out this form (please print):

NAME		
First	Initial	Last
MAILING ADDRESS		
City	State	Zip

When was the bear killed? \_\_\_\_/\_\_\_\_/\_\_\_\_  
(Mo/day/yr)

Where was the bear killed (specific location)? \_\_\_\_\_  
\_\_\_\_\_

Did you shoot the bear? ☐ Yes  
☐ No \_\_\_\_\_  
(Name of person who shot the bear)

Was the person who shot the bear an Alaska resident? ☐ Yes \_\_\_\_\_ Years  
☐ No \_\_\_\_\_  
(State or Country)

Please explain why this bear was killed, and what was done to prevent killing it, if anything: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(continue on next page)

**FOR OFFICIAL USE ONLY**  
To Be Filled Out By Agent

Sealing Certificate # \_\_\_\_\_

Type of Kill:

DLP \_\_\_\_\_  
Nat. Mort./Unknown \_\_\_\_\_  
Road Kill \_\_\_\_\_  
Research \_\_\_\_\_  
Illegal \_\_\_\_\_  
Other \_\_\_\_\_

Items Received:

Skull \_\_\_\_\_  
Hide \_\_\_\_\_  
Other \_\_\_\_\_  
None \_\_\_\_\_

Condition of Hide:

Good \_\_\_\_\_  
Fair \_\_\_\_\_  
Poor \_\_\_\_\_

Disposition of Hide:

Shipped for Auction \_\_\_\_\_  
Held as Evidence \_\_\_\_\_  
Destroyed \_\_\_\_\_

Complete the following ONLY if sealing certificate is NOT available:

Game Mgmt. Unit \_\_\_\_\_  
Species \_\_\_\_\_  
Sex \_\_\_\_\_  
Estimated Age \_\_\_\_\_  
Uniform Code \_\_\_\_\_

Provide additional comments in the space provided on the last page of this form and return form, sealing certificate, and hide to the above address

Lined paper template with three binder holes on the right side.

(add additional blank pages if necessary)

The following questions will give the Alaska Department of Fish and Game information on the types of bears killed, what kind of damage they cause, and possible ways to help people minimize problems with bears. Please answer these questions even if you have already answered them in your written statement on pages 1 and 2. Read each question carefully and choose the best answer that describes what happened. Write the number of the best answer in the box next to the question.

1) The bear was ☐

- 1 = alone
- 2 = with another adult
- 3 = with offspring thought to be cubs-of-year
- 4 = with offspring thought to be older than cubs-of-year
- 5 = with its mother
- 6 = with other littermates (brothers or sisters)

2) Other bears killed in this incident ☐

- 1 = none
- 2 = one other adult
- 3 = two adults
- 4 = one offspring
- 5 = two offspring
- 6 = three offspring
- 7 = one other littermate (brother or sister)
- 8 = two other littermates (brother or sister)

3) Did the bear hurt anyone? ☐

- 1 = no people injured
- 2 = yes, minor injuries
- 3 = yes, injuries requiring hospitalization
- 4 = yes, someone was killed

4) Why was the bear killed? ☐

- 1 = bear was an immediate threat (charging)
- 2 = bear was thought to be dangerous
- 3 = to protect property

5) What kind of property (if any) was threatened or damaged? ☐

- 1 = dwelling
- 2 = land vehicle
- 3 = boat
- 4 = pet
- 5 = game cache
- 6 = fish cache
- 7 = reindeer
- 8 = game kill
- 9 = camping gear
- 10 = subsistence fishing equipment/drying rack
- 11 = commercial fishing equipment
- 12 = livestock/poultry
- 13 = airplane
- 14 = food or groceries other than cached game or fish
- 15 = other property \_\_\_\_\_ (be specific)

6) How much damage did the bear do? ☐

- 1 = does not apply
- 2 = less than \$100
- 3 = \$100 - \$1,000
- 4 = \$1,000 - \$5,000
- 5 = more than \$5,000

7) Which of these *best* describes where the bear was killed? ☐

- 1 = in back country (not close to any cabin, dwelling, or campsite)
- 2 = at or near a temporary campsite
- 3 = at or near a lodge or seasonal-use cabin in a remote area
- 4 = at or near a permanent residence in a remote area
- 5 = in or near a village or remote community
- 6 = in or near an urban area (town, city, etc.)
- 7 = in or near a dump or garbage container in an urban or village area
- 8 = in or near a dump or garbage container at a development, construction, logging, or mining site
- 9 = at or near a development, construction or mining site (not in an urban area or village)
- 10 = public campground
- 11 = logging camp or logging road
- 12 = mining operation
- 13 = livestock ranch or farm
- 14 = near reindeer
- 15 = at a set net or subsistence fishing site
- 16 = near commercial fishing vessel
- 17 = near a cannery or related facilities
- 18 = near a salmon weir
- 19 = other \_\_\_\_\_ (be specific)

8) What were you (the person who killed the bear) doing when you first saw the bear? ☐

- |  |  |
|--|--|
| 1 = hunting  | 12 = wildlife research                                 |
| 2 = sport fishing  | 13 = conducting depredation or other control operation |
| 3 = photography  | 14 = at home or dwelling                               |
| 4 = hiking   | 15 = traveling on a road                               |
| 5 = camping  | 16 = trapping  |
| 6 = commercial fishing   | 17 = berry picking                                     |
| 7 = subsistence fishing  | 18 = reindeer herding                                  |
| 8 = recreation boating   | 19 = personal-use wood-cutting                         |
| 9 = riding on/in ORV, ATV, snowmachine, etc.                           | 20 = mining  |
| 10 = logging-related activity  | 21 = ranching  |
| 11 = working (stream census, geological studies, survey mapping, etc.) | 22 = official public safety/wildlife agency response   |
|  | 23 = other _____ (be specific)                         |

9) If you answered hunting, fishing, or photography in the last question (8), what kind of fish or animal were you after? ☐

- |                    |                 |                                |
|--------------------|-----------------|--------------------------------|
| 1 = does not apply | 6 = elk         | 11 = small game/waterfowl      |
| 2 = moose          | 7 = goats       | 12 = salmon                    |
| 3 = caribou        | 8 = brown bear  | 13 = other fish                |
| 4 = sheep          | 9 = black bear  | 14 = other _____ (be specific) |
| 5 = deer           | 10 = furbearers |                                |

10) What was the bear doing just before it was killed? ☐

- 1 = attracted to hunter-killed game or gutpile while you were there
- 2 = on or near hunter-killed game or gutpile when you approached
- 3 = on or near the bear's own kill
- 4 = in or near salmon stream
- 5 = feeding on vegetation or berries
- 6 = attracted to or eating human food other than cached fish or game
- 7 = robbing fish cache/drying rack
- 8 = robbing game cache
- 9 = attracted to or eating garbage
- 10 = breaking into a dwelling
- 11 = molesting or eating reindeer/livestock, including poultry
- 12 = at or near a den
- 13 = protecting offspring
- 14 = attracted to an animal call
- 15 = attracted to or feeding at baiting station
- 16 = at a camp or public-use cabin
- 17 = attracted to fish weir or hatchery facility
- 18 = sleeping
- 19 = bear activity unknown, bear charged for no apparent reason
- 20 = other \_\_\_\_\_ (be specific)

11) Had this bear caused problems before? ☐

- 1 = I don't know
- 2 = no
- 3 = yes, one time
- 4 = yes, 2 - 10 times
- 5 = yes, more than 10 times

12) What was done to stop the bear from causing a problem, before it was killed? ☐

- 1 = nothing
- 2 = warning shot (did not hit bear)
- 3 = shouted and made noise
- 4 = shot with shotgun
- 5 = moved away from bear
- 6 = other \_\_\_\_\_

Do you have any comments about what might have been done differently to avoid the problem with this bear?

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DATE \_\_\_\_\_



**Appendix L**  
**Employee Exposure/Injury Report**

## FORM 9-1

## EMPLOYEE EXPOSURE/HAZARDOUS CHEMICAL RELEASE REPORT

Client: \_\_\_\_\_ Site: \_\_\_\_\_

Name: \_\_\_\_\_ Site Location: \_\_\_\_\_

SSN: \_\_\_\_\_

Occupation: \_\_\_\_\_ Incident: \_\_\_\_\_

Description (Date/Time): \_\_\_\_\_

List Amount Of Time Lost From Work (if any): \_\_\_\_\_

Person To Whom Incident Was Reported: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Weather Condition During Incident: Temperature \_\_\_\_\_ Wind Speed &amp; Direction \_\_\_\_\_

Humidity \_\_\_\_\_ Cloud Cover \_\_\_\_\_ Clear \_\_\_\_\_ Precipitation \_\_\_\_\_

Materials Potentially Encountered:

Chemical (Give chemical name or description-liquid, solid, gas, vapor fume, mist):

\_\_\_\_\_  
\_\_\_\_\_

Radiological: \_\_\_\_\_

Volume Or Quantity Released: \_\_\_\_\_

Other: \_\_\_\_\_

Nature Of The Exposure/Release:

State the nature of the exposure/release in detail and list the parts of the body affected and potential on-site and off-site receptors: (Attach extra sheets if needed)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Was Medical Care Received? Yes ( ) No ( )

If So, When? \_\_\_\_\_



## FORM 9-1

## EMPLOYEE EXPOSURE/HAZARDOUS CHEMICAL RELEASE REPORT

Where? On-Site \_\_\_\_\_ Off-Site \_\_\_\_\_

By Whom? Name Of Paramedic: \_\_\_\_\_

Name Of Treating Physician: \_\_\_\_\_

Other: \_\_\_\_\_

If "Off-Site", Name Facility (hospital, clinic, etc.): \_\_\_\_\_

Length Of Stay At The Facility? \_\_\_\_\_

Was The Health And Safety Manger Contacted? Yes( ) No( ) Date/Time: \_\_\_\_\_

Was The Medical Consultant Contacted? Yes( ) No( )

If So, Who Was The Contact? \_\_\_\_\_ Date/Time: \_\_\_\_\_

Did The Exposure Result In Disability? Yes( ) No( )

If So, Estimated Length Of Disability: \_\_\_\_\_

Who Authorized Disability?: \_\_\_\_\_

Has The Employee Returned To Work? Yes( ) No( )

If So, Give Date: \_\_\_\_\_

List The Names Of Other Persons Affected During This Incident: \_\_\_\_\_

\_\_\_\_\_

List The Names Of Persons Who Witnessed The Exposure/Release Incident: \_\_\_\_\_

\_\_\_\_\_

Possible Cause Of The Exposure/Release: \_\_\_\_\_

\_\_\_\_\_

Was The Operation Being Conducted Under An Established Health And Safety Plan? Yes( ) No( )

If No, Explain: \_\_\_\_\_

Were Agency/Client Contacts Made? \_\_\_\_\_ Date/Time: \_\_\_\_\_

List Agencies/Persons Contacted: \_\_\_\_\_

\_\_\_\_\_

## FORM 9-1

## EMPLOYEE EXPOSURE/HAZARDOUS CHEMICAL RELEASE REPORT

Describe Protective Equipment And Clothing Used By The Employee (List Equipment, Make, Model) \_\_\_\_\_

Other Information, Comments (Attach relative data if necessary): \_\_\_\_\_

What Was The Employee Doing When The Exposure/Release Occurred? (Describe briefly as "Site Reconnaissance", "Site Categorization", "Sampling", etc.) How Did The Exposure/Release Occur? (Describe fully what factors led up to and/or contributed to the incident):

What Follow-Up Actions Occurred? \_\_\_\_\_

What Corrective Action(s) Or Change To The Site Health & Safety Plan, If Any, Have Been Or Will Be Taken To Avoid Recurrence Of The Exposure And/Or Release? This question is to be completed by the Site Manager or Site Health & Safety Officer.

Additional Comments: \_\_\_\_\_

\_\_\_\_\_  
Project Manager (Print or Type)

\_\_\_\_\_  
Project Manager (Signature)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Site Health & Safety Officer  
(Print or Type)

\_\_\_\_\_  
Site Health & Safety Officer  
(Signature)

\_\_\_\_\_  
Date

**Appendix M**  
**Accident Investigation and Notification Form**

## ACCIDENT INVESTIGATION AND NOTIFICATION

### 1.0 OBJECTIVE

1.1 This Standard Operating Procedure provides the following:

1.1.1 Effective investigation and analysis of accidents/post-accident procedures

1.1.2 Reporting and recording procedures for accidents, injuries, and hazardous chemical releases and exposures

1.1.3 Applicable site postings

1.1.4 Accident response procedures

### 2.0 APPLICABILITY

2.1 This procedure applies to all employees covered by the Jacobs Environmental Health and Safety Program. The information herein will be included in the Emergency Preparedness Section of site health and safety plans.

### 3.0 SCOPE

3.1 The scope of this SOP is intended to cover accident investigation and notification of all accidents and/or incidents including "near misses." This SOP further covers procedure, reporting, and record keeping requirements for personal injury, illness, and exposure. Also covered are any accidental releases of hazardous chemicals and/or property damage occurring as a consequence of site activity.

### 4.0 PROGRAM ADMINISTRATION DEFINITIONS

4.1 The *Corporate Health and Safety Manager* (CHSM) is responsible for reviewing all occupationally-related injuries, illnesses, and exposures, including First Aid only and OSHA reportable incidents, and hazardous chemical releases. The CHSM is also responsible for taking necessary corrective action based on submitted reports and notifications.

4.2 The *Corporate Health and Safety Administrator* (CHSA) is responsible for maintenance for all corporate health and safety files and collecting all occupationally-related injury, illness, exposure, and hazardous chemical release information.

4.3 The *Site Manager* (SM) is responsible for conducting investigations of accidents/incidents and "near misses." After identification of problems, corrective actions will be instituted. All findings and corrective actions will be documented on the Site Manager's Investigation Report.

- 4.3.1 The SM is also responsible for coordinating with the Corporate Health & Safety Office, local Jacobs Human Resources Department, and Regional Safety Department to insure completion, filing, and posting of all OSHA forms 200 and 101 for reportable site injuries, illnesses, and exposures.
  - 4.3.2 The SM shall notify the CHSM and Regional or Regional Safety Department Representative of all occupationally-related injuries, illnesses, and exposures, including First Aid only and OSHA reportable incidents, and hazardous chemical releases.
  - 4.4 The *Site Health and Safety Officer* (SHSO) is responsible for assisting the SM in the above listed responsibilities.
    - 4.4.1 If a SHSO is not appointed, a designated personnel may be delegated to assist the Site Manager in the reporting and record keeping responsibilities.
  - 4.5 The *Local Human Resources Representative* (LHRR) is responsible for: processing workmans' compensation claims and coordinating approved company doctor, hospital, or clinic for office injuries/exposures. The LHRR is also responsible for following Jacobs Safety Department *and* Corporate Health and Safety Department procedures for office injuries and exposures. In addition, the LHRR shall complete, file, and post OSHA Forms 200 and 101 for reportable office injuries and exposures. This includes injuries while traveling for business.
  - 4.6 The *Regional Safety Department Representative* (RSDR) is responsible for administering the Jacobs Safety Program. Therefore, reporting procedures include notifying the primary contacts designated in attachment A.
- 5.0 **PROCEDURE - GENERAL**
- 5.1 The following information will be obtained as appropriate:
    - 5.1.1 **Approved Company Doctor, Clinic, or Hospital**  
Prior to initiation of any onsite activities requiring health and safety plans, the SHSO will contact the Coordinator in the Corporate Risk Management Department in Pasadena at (818) 578-6886 to obtain a list of approved medical facilities for the site location.
- 6.0 **PROCEDURE - ACCIDENT RESPONSE**
- 6.1 Injured/ill employees shall be taken to approved facilities. To obtain a list of approved doctors, clinics, or hospital, see 5.1.1.
    - 6.1.1 An Authorization for Medical Treatment Form (attachment B) is to accompany each injured/ill employee. The top portion of the form is to be completed by job site personnel and the attending physician is

to complete the bottom portion. The completed form must be forwarded to the appropriate regional contact (See attachment A) within 48 hours of each visit. A Workers' Compensation Form (completed by LHRR) may also be required.

## **7.0 PROCEDURE - POST-ACCIDENT**

- 7.1 After the employee has received treatment, the Site Health and Safety Officer will arrange for a post-accident drug screen for all injured employees immediately following an accident. Hepatitis B vaccine may need to be offered to employees who were exposed to blood during responding to an incident. Review SOP 7.6 Bloodborne Pathogens.
- 7.2 Initial accident investigation shall begin at the discretion of the Site Health and Safety Officer and/or the Site Manager. At a minimum, the scene shall be secured (no movement of material or equipment shall be made until a review of the accident is completed) and signed statements from witnesses shall be obtained.

## **8.0 REPORTING**

All occupationally-related injuries, illnesses, accidents, exposures, hazardous chemical releases, and property damage will be appropriately reported. Completion of this activity is imperative to detecting trends and establishing actions to prevent recurrence.

- 8.1 A verbal report must be made to the CHSM *and* RSDR as soon as possible for all occupationally-related injuries (including First Aid only incidents,) illnesses, exposures, and hazardous chemical releases.
- 8.2 Serious or fatal injuries are to be reported *immediately* to the CHSM, the RSDR, the appropriate Operations Manager, and the appropriate Group Vice President.
- 8.3 The following must be reported to the CHSM, RSDR, and the appropriate Operations Manager with the appropriate form(s) (See Section 9.0 Record Keeping): All job related injuries and illnesses requiring a doctors visit, all exposures, and hazardous material releases in potentially reportable quantities (by EPA-RCRA definitions.)
- 8.4 The following information must be made available:
  - 8.4.1 Name, social security number, office location, job title
  - 8.4.2 Date and location of accident or incident
  - 8.4.3 Description of the event/and injury - (extent)
  - 8.4.4 Potential for lost time

8.4.5 What medical facility was used and when

8.4.6 Who rendered First Aid/CPR

8.5 The Corporate Risk Management Department in Pasadena will be contacted to report all property damage. (See attachment A)

8.6 The Project Manager will contact the client

## 9.0 RECORD KEEPING

All occupationally-related injuries, illnesses, accidents, and hazardous chemical release (exposure) incidents will be appropriately recorded. The following reports will be made and submitted:

9.1 Site Managers Investigation Report (See attachment F)

To be completed by the first line Site Manager as soon as possible following the incident. Return completed form to the RSDR. A copy *must* also be sent to the CHSM.

9.2 Witness Statement (See attachment G)

To be used to obtain a signed statement from witnesses of their complete (factual) observations. Names and permanent addresses shall be secured for future reference. Return to the RSDR. A copy *must* also be sent to the CHSM.

9.3 Employee's Report of Occupational Injury or Disease (See attachment H)

This form is state specific. This form must be completed for all injuries, illnesses, and exposures requiring a doctor's visit. The location code (project number) will be used as the form of identification. Return this form to the RSDR within 24 hours of initial doctor's visit. A copy *must* also be sent to the CHSM.

9.4 Employee Exposure/Hazardous Chemical Release Report Form 9-1 (See attachment C)

9.4.1 All incidents involving exposure to potentially hazardous materials while working, including incidents onsite, in the office, during company travel, and hazardous material releases in potentially reportable quantities (by EPA-RCRA definitions) must be reported to CHSM. Document the incident on Employee Exposure/Hazardous Chemical Release Report, Form 9-1.

9.4.1.1 Further notification procedures i.e., agency notifications, shall be followed as outlined in the site specific health and safety plan.

9.4.2 The SM shall complete and return Form 9-1 to the CHSM as soon as possible. A copy of this form *must* also be sent to the RSDR. This form is to be completed for all hazardous chemical exposure and release incidents *only*.

9.4.3 It is important to report all exposures even though the incident is not considered serious or no adverse health effects or symptoms are apparent at the time.

9.4.4 The employee must be given a copy of the report. Additional copies must be placed in the employee's corporate health and safety medical file and exposure file.

9.5 First Aid Register (See attachment E)  
This is the primary project injury log. All injuries/illness, treated or reported (actual or alleged), shall be entered into the log. This register is to be used no matter how minor the event may be. *There are no exceptions to this reporting requirement.* The register is kept at the project site.

9.6 Vehicle Accident Reporting Procedure (See attachment I)  
For any vehicle accident or injuries involving a vehicle, please follow and complete necessary forms dictated by the Vehicle Accident Reporting Procedures.

## 10.0 OSHA REPORTING/RECORD KEEPING PROCEDURES

10.1 Preparation and Maintenance of records relating to occupational injuries, illnesses, and exposures required by OSHA will be maintained by:

Office-related This includes injuries or accidents while on company-related travel.

LHRR

Project Site-related

SHSO or designated personnel

10.2 Log and Summary of Occupational Injuries and Illnesses Form - OSHA Form 200 (See attachment D)

10.2.1 All occupational injuries and illnesses that require treatment other than First Aid are reported on OSHA Form 200 - Log and Summary of Occupational Injuries and Illnesses. Information for each "recordable case" of occupational injury or illness shall be entered on the form within six (6) work days after learning of its occurrence.

10.2.1.1 A "recordable case" is defined on the front of OSHA Form 200 as "...every occupational death, every nonfatal occupational illness, and



those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid)..." Further definitions and instructions are provided on the back of the form.

10.2.1.2 OSHA's record keeping and reporting requirements differ from those under the various State Workers' Compensation laws. Because they differ, employers must not substitute Workers' Compensation criteria for determining whether or not a case should be recorded for OSHA.

10.2.2 All entries on OSHA Form 200 must be identified by a case or file number. Entry numbers must be non-duplicating to facilitate comparison with OSHA Form 101, Supplementary Record of Occupational Injuries and Illnesses (described in section 10.3).

10.2.3 One OSHA Form 200 is used at the project site or office location per year. Each incident is added to the same form on a separate line.

10.2.4 A copy of OSHA Form 200 with injury/illness information recorded shall be sent to the CHSM and RSDR within 45 calendar days of its recording.

10.2.5 At the beginning of each calendar year, a summary of all injuries and illnesses recorded on OSHA Form 200 for the preceding year must be made. Instructions on the back of Form 200 describe how the summary is compiled. Even if there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

10.2.5.1 The OSHA 200 Form must be posted with summary information for the preceding year where notices to employees are commonly posted *no later than February 1 and must remain in place until March 1.*

10.2.5.2 A copy of the summary OSHA Form 200 *must* be sent to the CHSA and RSDR at year end no later than January 15.

### 10.3 Supplementary Record of Occupational Injuries and Illness - OSHA Form 101. (See attachment K)

10.3.1 To supplement the Log and Summary of Occupational Injuries and Illnesses - OSHA Form 200, each establishment must maintain a record of each recordable occupational injury or illness. If no suitable report is made for other purposes, the Supplementary Record OSHA No. 101 may be used.

10.3.1 Or, the record may consist of the one or more of the documents listed below.

10.3.1.1 Workers' Compensation, insurance, or other reports are also acceptable as records if they contain all facts listed below or are supplemented to do so.

10.3.1.2 The record may also be listed on a plain sheet of paper containing the following facts. For further information, please see Definitions on the back of OSHA Form 200:

- 1) *About the employer*-name, mail address, and location if different from mail address.
- 2) *About the injured or ill employee*-name, social security number, home address, age, sex, occupation, and department.
- 3) *About the accident or exposure to occupational illness*-place of accident or exposure, whether it was on employer's premises, what the employee was doing when injured, and how the accident occurred.
- 4) *About the occupational injury or illness*-description of the injury or illness, including part of body affected, name of the object or substance which directly injured the employee, and date of injury or diagnosis of illness.
- 5) *Other*-name and address of physician; if hospitalized, name and address of

hospital, date of report, and name and position of person preparing the report.

10.3.2 These records must also be available without delay and at reasonable times for examination by representatives of the Department of Labor and the Department of Health, Education and Welfare, and States accorded jurisdiction under the Act.

10.3.3 The records must be maintained for a period of not less than five years following the end of the calendar year to which they relate.

## 11.0 SITE POSTINGS

11.1 The following forms will be posted for all on-going field projects. Contact your Regional Safety Department or local OSHA office to obtain these forms and postings.

11.1.1 Jacobs Forms: First Aid Register  
Emergency Phone Numbers Specific to the Site

11.1.2 OSHA Forms: OSHA 200 Log  
OSHA Health and Safety Poster (or State Equivalent)  
Access to Medical and Exposure Records  
OSHA Permits  
Forklift Operating Instructions

11.1.3 Human resource forms and postings appropriate to each job site will be obtained from regional contacts and kept onsite as required. (See attachment J)

## 12.0 ATTACHMENTS

The following attachments are included with this SOP:

Attachment A	Primary Contacts
Attachment B	Authorization For Medical Treatment
Attachment C	Employee Exposure/Hazardous Chemical Release Report
Attachment D	OSHA Form 200 - Log and Summary of Occupational Injuries and Illnesses
Attachment E	First Aid Register
Attachment F	Site Manager's Investigation Report
Attachment G	Witness Statement
Attachment H	Employee's Report of Occupational Injury or Disease
Attachment I	Vehicle Accident Reporting Procedure
Attachment J	Human Resources Contacts
Attachment K	OSHA Form 101 - Supplementary Record of Occupational Injuries and Illness

# **Attachment A**

## **PRIMARY CONTACTS**

**Corporate Environmental Health and Safety Department**  
Jacobs Engineering Group, Inc.  
600 Seventeenth Street, Suite 1100N  
Denver, Colorado 80202  
Attention: Terry Briggs  
Office Phone: (303) 595-8855  
FAX Machine: (303) 595-8857

**Pasadena Risk Management (Safety) Department**  
Jacobs Engineering Group, Inc.  
251 S. Lake Avenue  
Pasadena, California 91101  
Attention: Pat Costamagna  
Office Phone: (818) 578-6886  
FAX Machine: (818) 578-6837

**Central Region Safety Department**  
Jacobs Engineering Group, Inc.  
4848 Loop Central Drive  
Houston, Texas 77081-2211  
Attention: Steve Pianalto  
Office Phone: (713) 669-2200  
FAX Machine: (713) 669-0045

**Eastern Region (Including Louisiana) Safety Department**  
Jacobs Engineering Group, Inc.  
4949 Essen Lane  
Baton Rouge, Louisiana 70809  
Attention: C.J. Beysellance  
Office Phone: (504) 769-7700  
FAX Machine: (504) 768-5228

**Midwest Region Safety Department**  
Jacobs Engineering Group, Inc.  
1880 Waycross Road  
Cincinnati, Ohio 45240  
Attention: Bill Minear  
Office Phone: (513) 595-7500  
FAX Machine: (513) 595-7717

**Western Region Safety Department**  
Jacobs Engineering Group, Inc.  
251 S. Lake Avenue  
Pasadena, California 91101  
Attention: Ken Wilkenson  
Office Phone: (818) 449-2171  
FAX Machine: (818) 578-6827  
Home Phone: (805) 255-6973





FROM: \_\_\_\_\_  
TO: \_\_\_\_\_  
DATE: \_\_\_\_\_ PAGE \_\_\_\_\_ OF \_\_\_\_\_  
JOB NUMBER: \_\_\_\_\_  
LOCATION: \_\_\_\_\_

[illegible]

### SITE MANAGER'S INVESTIGATION REPORT

**WHY:** PREVENTION is the primary reason. PREVENTION is the goal of accident investigation. Your investigation should be an attempt to reveal the causes so that they may be eliminated. Eliminating causes will PREVENT a recurrence.

**WHAT HAPPENED:** Before the causes can be determined, you, the supervisor, must get the accurate facts of what happened. These should give a clear description of what actually took place. The injured or involved person or persons are usually best able to describe what happened. Witnesses are also important. You should interview everyone involved before writing down the description.

**WHY DID THIS HAPPEN:** Once you know exactly what happened, you must analyze the facts and determine the causes.

First, you must determine the immediate cause or causes, such as someone's improper actions, faulty equipment, or other conditions which directly caused the accident or incident. More than one cause often exists, and you must give careful consideration to all possible causes. List them on your report.

The second part of the analysis involves some "backtracking." Think through the immediate causes you listed and try to give the reasons they existed. For example, the box that fell from a pallet of stock might be the immediate cause of injury to an employee. By "backtracking", the underlying, more fundamental causes can be determined. The pallet wasn't stacked properly. It was stacked improperly because the boxes were wet and soggy. They were wet because a section of the roof leaked and needed repairs, or because they were unloaded on an open loading dock in the rain, etc. List as many as possible. "Backtrack" as far as possible.

**WHAT CORRECTIVE ACTION:** After you have analyzed the causes, eliminate them. As the first-line supervisor you can probably do a great deal on your own to eliminate causes. Give additional training in safe, proper working procedures to your workers. Correct any housekeeping problems in your area of responsibility. Check machinery more often. Indicate on the report what you can do and what you have done to prevent a recurrence. For those causes beyond your direct control (such as the leaky roof in the example above), indicate what things should be done by management to eliminate the causes. This is your chance to advise them of what should be done to improve work efficiency and eliminate possible accident producing situations.

Remember--PREVENTION of recurrences is the purpose of your investigation and report. Be concise in your report. Avoid finding fault with individuals. Avoid vague, general descriptions or causes such as "carelessness". As the first-line supervisor, you are in the best position to understand the real causes of an accident or incident. Eliminating them will benefit you by providing safe working conditions for you and your workers while improving the efficiency of your crew.



THE USE OF THIS FORM IS REQUIRED UNDER THE PROVISIONS OF THE ALABAMA WORKERS' COMPENSATION LAW

Alabama  
(Appendix 1)WCC Form 2  
Rev. 1986STATE OF ALABAMA  
EMPLOYER'S FIRST REPORT OF INJURY OR OCCUPATIONAL DISEASEOSHA CASE OR  
FILE NUMBER

Send to: Your workers' compensation insurance carrier, in duplicate

PRINT OR TYPE

Carrier's File No. \_\_\_\_\_

EMPLOYER

EMPLOYEE

INJURY OR ILLNESS

WAGE INFORMATION

Do Not Write  
The Space BelowEmployer's  
←Carrier Name  
←

SIC

Carrier-Fu

Sec. Sec. 1  
←

Sex

Marital Sta

Dependent

Age

Occupation

Date of Occurrence

On Premises

Event Date

Employer's

Injury Source

Accident Type

Nature of Injury

Part of Body

Date of Onset

Stopped Working

Time Employed

Time in Job

Weekly Wage

Report Date

Report Recipient

Date of Report

Case Classification

1. EMPLOYER'S NAME AND MAILING ADDRESS  
(No. & Street, City, County, State, ZIP)LOCATION, IF DIFFERENT FROM MAILING  
ADDRESS

TELEPHONE NUMBER

2. EMPLOYER IDENTIFICATION  
(U.C. ACCOUNT) NUMBER3. CARRIER OR SELF-INSURANCE  
REGISTRATION NUMBER

4. NATURE OF BUSINESS (Manufacturing, Trade, Transportation, etc.)

SPECIFIC PRODUCTS

5. WORKERS' COMPENSATION PROVIDED BY: INSURANCE CARRIER ( ) SELF-INSURANCE ( ) GROUP FUND ( )  
IF INSURANCE CARRIER, GIVE NAME AND ADDRESS:

6. EMPLOYEE'S NAME (Last) (First) (Middle)

7. SEX  
MALE ( )  
FEMALE ( )

8. AGE

9. SOCIAL SECURITY NO.

10. EMPLOYEE'S HOME ADDRESS (No. &amp; Street or RFD, City, County, State, ZIP)

11. MARITAL STATUS: SINGLE ( )  
MARRIED ( ) DIVORCED ( )  
SEPARATED ( ) WIDOWED ( )

12. HOME TELEPHONE

13. REGULAR OCCUPATION

14. WORKING IN WHAT DEPARTMENT WHEN  
HURT

15. PLACE OF ACCIDENT OR EXPOSURE (Address or location, include County)

16. ON EMPLOYER'S  
PREMISES?  
YES ( ) NO ( )

17. Date of Occurrence

18. TIME OF DAY  
a.m. ( )  
p.m. ( )

19. Date Disability Began

20. Date Employer Notified

21. DESCRIBE THE INJURY OR ILLNESS IN DETAIL AND INDICATE THE PART OF THE BODY AFFECTED.  
(e.g., amputation of right index finger at second joint, fracture of 2 ribs, lead poisoning, dermatitis of left hand, etc.)

22. IF FATAL, GIVE DATE OF DEATH

23. WHAT THING DIRECTLY PRODUCED THIS INJURY OR ILLNESS?

(Name object struck against or struck by; vapor, poison, chemical or radiation; if strain or hernia, the thing being lifted, pulled, pushed, etc.; if injury resulted solely from bodily motion, the stretching, twisting, etc. which resulted in injury.)

24. HOW DID THE ACCIDENT OR EXPOSURE OCCUR?

(Begin by telling what the employee was doing just before the accident or exposure. Be specific. If employee was using tools or equipment, or handling material, name them and tell what employee was doing with them.)

(Now describe fully the events which resulted in injury or illness. Tell what happened and how it happened. Specify how objects or substances were involved. Give full details of all factors which led or contributed to the accident or exposure.)

25. NAME AND ADDRESS OF TREATING PRACTITIONER

NAME AND ADDRESS OF HOSPITAL

HOSPITALIZED ( )  
OUT-PATIENT ( )  
EMERGENCY  
TREATMENT ( )26. Has Injured Returned  
to Work?  
Yes ( ) No ( )

27. If so, Date

28. At What Wage?

29. At What Occupation?

30. LENGTH OF TIME IN YOUR EMPLOY?

31. LENGTH OF TIME IN  
PRESENT JOB32. NUMBER OF  
DEPENDENTS

33. Average Weekly Wage

34. Weekly Value of Remuneration Other  
Than Wages (Food, Lodging, etc.)  
\$35. DID EMPLOYEE RECEIVE FULL  
PAY FOR DAY OF INJURY?  
YES ( ) NO ( )

36. Date of This Report

37. Signed by

38. Signature

39. Official Position or Title

## VEHICLE ACCIDENT REPORTING PROCEDURE

### 1.0 Purpose

To set for the minimum requirements for the timely and accurate reporting of vehicular accidents.

### 2.0 Scope

This procedure applies to all Region operations and projects.

### 3.0 Responsibilities

- 3.1 Operations Managers are responsible for assuring that their respective department, project and other managers, and supervisors fully understand and comply with this procedure and any supplementary procedure(s).
- 3.2 All managers and supervisors are responsible for assuring that all employees reporting to them fully understand and comply with this procedure and any supplementary procedure(s).
- 3.3 Any employee involved in an accident while using a Jacobs pool car, rental car on company business, or other company owned, rented, or operated vehicle or heavy equipment, shall comply with this procedure and any supplementary procedure(s).

### 4.0 Requirements

- 4.1 Each office and project site shall develop a supplementary vehicle accident reporting procedure to address any applicable local and state requirements and/or client requirements.
- 4.2 At a minimum, the police will be notified and a police accident report filed for any accident involving another vehicle or property when damages are estimated to be greater than \$500.00 or when there is allegedly bodily injury (more stringent requirements by local, state or client shall be addressed by a supplementary office or project procedure).
- 4.3 All vehicle and/or equipment accidents shall be verbally reported to the Pasadena Risk Management Department and Western Region Safety Department (see Exhibit A) within 24 hours of the accident.
- 4.4 The employee assigned to the vehicle or equipment, or who holds the vehicle rental agreement, shall be responsible for completing and returning the following to the Pasadena Risk Management Department:
  - Cigna "Notice of Automobile Accident" (Exhibit B);
  - Copies of any completed local, state or client required forms.
- 4.5 If the vehicle involved in the accident is a Jacobs pool car, the employee assigned to the vehicle is responsible for obtaining two written estimates for repair of the Jacobs vehicle and obtaining a copy of the police investigation report (when applicable). All information is to be sent to the Pasadena Risk Management Department.

JACOBS ENGINEERING GROUP INC.  
AUTO ACCIDENT REPORT

Date of Accident \_\_\_\_\_ Time of Accident \_\_\_\_\_  
Location of Accident \_\_\_\_\_

Driver of Company Vehicle

Name \_\_\_\_\_ Date of Birth \_\_\_\_\_  
Address \_\_\_\_\_  
Home Phone No. \_\_\_\_\_ Driver's License No. \_\_\_\_\_  
License Number \_\_\_\_\_  
Serial Number of Vehicle \_\_\_\_\_  
Name of Other Passengers in Vehicle \_\_\_\_\_  
Equipment Number \_\_\_\_\_

Driver of Other Vehicle

Name of Driver \_\_\_\_\_  
Home Address of Driver \_\_\_\_\_  
Phone Number Home \_\_\_\_\_ Work \_\_\_\_\_  
Driver's License Number (Including State) \_\_\_\_\_  
Employer \_\_\_\_\_  
Owner of Vehicle \_\_\_\_\_  
Serial Number of Vehicle \_\_\_\_\_  
Make and Model of Car \_\_\_\_\_  
Relation of Driver to Owner of Vehicle \_\_\_\_\_  
Insurance Company of Owner \_\_\_\_\_  
Insurance Company of Driver & Policy Number \_\_\_\_\_

Description of Accident - \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Description of Damage to Vehicles

Company Vehicle \_\_\_\_\_

Other Vehicle \_\_\_\_\_

Place Where Damaged Vehicles Can Be Seen \_\_\_\_\_

Injuries (Explain) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Name of Law Enforcement Body Investigating Accident \_\_\_\_\_  
Name, Address & Phone No. of Witnesses \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

Job Name: \_\_\_\_\_ Job Number: \_\_\_\_\_

SITE MANAGER'S INVESTIGATION REPORT

Client: \_\_\_\_\_ Project Number: \_\_\_\_\_

Name: \_\_\_\_\_ Department: \_\_\_\_\_ Skill: \_\_\_\_\_

Age: \_\_\_\_\_ Location: \_\_\_\_\_ Date: \_\_\_\_\_

Site Manager: \_\_\_\_\_ Time: \_\_\_\_\_

Property Damage: Yes \_\_\_\_\_ No \_\_\_\_\_

What Happened: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_Nature of Incident: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Injury Potential: Major \_\_\_\_\_ Serious \_\_\_\_\_ Minor \_\_\_\_\_

Why Did This Happen?: \_\_\_\_\_  
\_\_\_\_\_

Possibility of Recurrence: Often \_\_\_\_\_ Seldom \_\_\_\_\_ Rarely \_\_\_\_\_

What Corrective Action Has Been/Will Be Taken? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Site Health &amp; Safety Officer: \_\_\_\_\_ Project Manager: \_\_\_\_\_

Report Written By: \_\_\_\_\_

Date of Report: \_\_\_\_\_ Time of Report: \_\_\_\_\_

DATE: \_\_\_\_\_

NAME: \_\_\_\_\_

**TITLE:** \_\_\_\_\_

SOCIAL SECURITY NUMBER: \_\_\_\_\_

TEMPORARY ADDRESS: \_\_\_\_\_

PHONE NO. \_\_\_\_\_

PERMANENT ADDRESS: \_\_\_\_\_

PHONE NO. \_\_\_\_\_

LOCATION AT TIME OF ACCIDENT: \_\_\_\_\_

DESCRIBE, TO THE BEST OF YOUR KNOWLEDGE, HOW THE ACCIDENT  
HAPPENED:

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Signature

## ATTACHMENT K

OSHA No. 101  
Case or File No. \_\_\_\_\_

Form approved  
OMB No. 44R 1453

## Supplementary Record of Occupational Injuries and Illnesses

## EMPLOYER

1. Name \_\_\_\_\_  
 2. Mail address \_\_\_\_\_  
     (No. and street)                      (City or town)                      (State)  
 3. Location, if different from mail address \_\_\_\_\_

## INJURED OR ILL EMPLOYEE

4. Name \_\_\_\_\_ Social Security No. \_\_\_\_\_  
     (First name)                      (Middle name)                      (Last name)  
 5. Home address \_\_\_\_\_  
     (No. and street)                      (City or town)                      (State)  
 6. Age \_\_\_\_\_ 7. Sex: Male \_\_\_\_\_ Female \_\_\_\_\_ (Check one)  
 8. Occupation \_\_\_\_\_  
     (Enter regular job title, not the specific activity he was performing at time of injury.)  
 9. Department \_\_\_\_\_  
     (Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)

## THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure \_\_\_\_\_  
     (No. and street)                      (City or town)                      (State)  
 If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.  
 11. Was place of accident or exposure on employer's premises? \_\_\_\_\_ (Yes or No)  
 12. What was the employee doing when injured? \_\_\_\_\_  
     (Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)

13. How did the accident occur? \_\_\_\_\_  
     (Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)

## OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

14. Describe the injury or illness in detail and indicate the part of body affected. \_\_\_\_\_  
     (e.g.: amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)  
 15. Name the object or substance which directly injured the employee. (For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.) \_\_\_\_\_  
 16. Date of injury or initial diagnosis of occupational illness \_\_\_\_\_  
     (Date)  
 17. Did employee die? \_\_\_\_\_ (Yes or No)  
 OTHER  
 18. Name and address of physician \_\_\_\_\_  
 19. If hospitalized, name and address of hospital \_\_\_\_\_  
 Date of report \_\_\_\_\_ Prepared by \_\_\_\_\_  
 Official position \_\_\_\_\_

# **AUTOMOBILE ACCIDENT OR LOSS NOTICE**

ESIS, Inc.  
a CIGNA company

Page 4 of



CONTRACT #	NAME OR COMPANY	FILE NO. (ESIS/MA USE ONLY)
------------	-----------------	-----------------------------

LOCATION CODES			
1	2	3	4

(1) COMPANY	NAME	PHONE
	ADDRESS	

(2) TIME & PLACE	DATE & TIME OF LOSS OR ACCIDENT		LOCATION
	<input type="checkbox"/> A.M. <input type="checkbox"/> P.M.		

(3) AUTO USED OR OCCUPIED BY CLIENT  MUST GIVE DRIVER'S AGE	YEAR	MAKE	MODEL	SERIAL NUMBER	MOTOR NUMBER	LICENSE NO., YEAR & STATE
	NAME OF OWNER			ADDRESS		<input type="checkbox"/> HOME    PHONE <input type="checkbox"/> BUS.
	NAME OF DRIVER			ADDRESS		<input type="checkbox"/> HOME    PHONE <input type="checkbox"/> BUS.
	RELATION TO OWNER (EMPLOYEE, ETC.)			WAS CAR USED WITH OWNER'S PERMISSION?		OTHER INSURANCE
	FOR WHAT PURPOSE WAS AUTO BEING USED AT TIME OF ACCIDENT					<input type="checkbox"/> YES <input type="checkbox"/> NO
	WHERE MAY AUTO BE SEEN (ADDRESS)?					ESTIMATED COST OF REPAIRS
	IF THEFT, SPECIFY PROPERTY STOLEN. IF COLLISION OR COMPREHENSIVE, SPECIFY DAMAGE					
	DATE, LOCATION & BADGE NO. OR NAME OF POLICE AUTHORITY TO WHOM ACCIDENT WAS REPORTED					

(4) DAMAGE TO PROPERTY OF OTHERS  Use Additional Sheet If Necessary	OWNER		ADDRESS		<input type="checkbox"/> HOME    PHONE <input type="checkbox"/> BUS.
	OTHER DRIVER — SAME AS ABOVE <input type="checkbox"/>		ADDRESS	OPERATOR LICENSE #	<input type="checkbox"/> HOME    PHONE <input type="checkbox"/> BUS.
	LIST DAMAGE, IF AUTO, MAKE YEAR, LICENSE NUMBER, YEAR & STATE				
	ESTIMATED COST OF REPAIRS				
WAS OTHER CAR INSURED?		NAME OF COMPANY & POLICY NUMBER			
<input type="checkbox"/> YES <input type="checkbox"/> NO					

(5) PERSONS INJURED	NAME				PASSENGER IN		EXTENT OF INJURIES
					CLIENT CAR	OTHER CAR	
	ADDRESS				PHONE	AGE	

For your protection California law requires the following to appear on this form. Section 556 of the Insurance Code reads as follows:

(a) Present or cause to be presented any false or fraudulent claim for the payment of a loss under a contract of insurance.

(b) Prepare, make, or subscribe any writing, with intent to present or use the same or to allow it to be presented or used in support of any such claim.

Every person who violates any provision of this section is punishable by imprisonment in the State prison not exceeding three years, or by fine not exceeding one thousand dollars or by both.

SEE REVERSE SIDE FOR ACCIDENT DESCRIPTION AND OTHER INFORMATION

DATE	SIGNATURE OF CLIENT OR DRIVER
------	-------------------------------

2.4 VEHICLE ACCIDENTS

2.4.1 Reporting

- o An Auto Accident Form (Appendix 2-7) shall be kept in all Company vehicles utilized for offsite service.
- o The form shall be completed by the driver of the vehicle in conjunction with his Supervisor and the Project Superintendent and forwarded within 24 hours after an accident to the Corporate Safety Department.

2.4.2 Requirements

- o The report shall be filed when a Company vehicle is involved in any type of accident.
- o The form shall also be used in filing reports of accidents involving equipment vehicles (onsite or offsite) such as cherry pickers, backhoes, trucks, cars, etc.

2.4.3 Distribution

- o The report shall be distributed as follows:
  - Equipment Yard - 1 Copy
  - Site File - 1 Copy
  - Corporate Insurance - Original
  - Corporate Safety Department - 1 Copy



**Attachment J**

**HUMAN RESOURCES CONTACTS**

**Central Region Human Resources Department**  
Jacobs Engineering Group Inc.  
4848 Loop Central Drive  
Houston, Texas 77081-2211  
Attention: Barry Rogers  
Office Phone: (713) 669-2200  
FAX Machine: (713) 669-0045

**Eastern Region Human Resources Department**  
Jacobs Engineering Group Inc.  
1880 Waycross Road  
Cincinnati, Ohio 45240  
Attention: John Kadash  
Office Phone: (513) 595-7500  
FAX Machine: (513) 595-7717

**Midwest Region Human Resources Department**  
Jacobs Engineering Group Inc.  
1880 Waycross Road  
Cincinnati, Ohio 45240  
Attention: John Kadash  
Office Phone: (513) 595-7500  
FAX Machine: (513) 595-7717

**Western Region Human Resources Department**  
Jacobs Engineering Group Inc.  
251 S. Lake Avenue  
Pasadena, California 91101  
Attention: William Gebhardt  
Office Phone: (818) 578-6886  
FAX Machine: (818) 578-6837

**Corporate Human Resources Department**  
Jacobs Engineering Group Inc.  
251 S. Lake Avenue  
Pasadena, California 91101  
Attention: William Gebhardt  
Office Phone: (818) 578-6886  
FAX Machine: (818) 578-6837

## SUPPLEMENTARY RECORD OF OCCUPATIONAL INJURIES AND ILLNESSES

To supplement the Log and Summary of Occupational Injuries and Illnesses (OSHA No. 200), each establishment must maintain a record of each recordable occupational injury or illness. Worker's compensation, insurance, or other reports are acceptable as records if they contain all facts listed below or are supplemented to do so. If no suitable report is made for other purposes, this form (OSHA No. 101) may be used or the necessary facts can be listed on a separate plain sheet of paper. These records must also be available in the establishment without delay and at reasonable times for examination by representatives of the Department of Labor and the Department of Health, Education and Welfare, and States accorded jurisdiction under the Act. The records must be maintained for a period of not less than five years following the end of the calendar year to which they relate.

Such records must contain at least the following facts:

- 1) *About the employer*—name, mail address, and location if different from mail address.
- 2) *About the injured or ill employee*—name, social security number, home address, age, sex, occupation, and department.
- 3) *About the accident or exposure to occupational illness*—place of accident or exposure, whether it was on employer's premises, what the employee was doing when injured, and how the accident occurred.
- 4) *About the occupational injury or illness*—description of the injury or illness, including part of body affected; name of the object or substance which directly injured the employee; and date of injury or diagnosis of illness.
- 5) *Other*—name and address of physician; if hospitalized, name and address of hospital; date of report; and name and position of person preparing the report.

SEE DEFINITIONS ON THE BACK OF OSHA FORM 200.

# EMPLOYERS' NOTICE OF INSURANCE

TO THE EMPLOYEES OF THE UNDERSIGNED:  
Your employer is insured by

\_\_\_\_\_  
Insurer (Or Insurance Company)

\_\_\_\_\_  
Street and Number

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

\_\_\_\_\_  
For the period from \_\_\_\_\_ through \_\_\_\_\_

\_\_\_\_\_  
Alaska Adjusting Company

\_\_\_\_\_  
Street and Number

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

\_\_\_\_\_  
Telephone

This insurance pays benefits for job-connected injuries, illnesses or death as provided by the Alaska Workers' Compensation Act.

\_\_\_\_\_  
Employer

\_\_\_\_\_  
By

\_\_\_\_\_  
Title

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Witness

Immediately (not later than 30 days from injury or death date) give your employer and the Alaska Workers' Compensation Board written notice of a job-related injury, illness, or death. Get the "Report of Occupational Injury or Illness" form from your employer for this purpose.

If you have questions about your rights or benefits under the Alaska Workers' Compensation Act, contact the insurer at the above address and the Alaska Workers' Compensation Board at the nearest office listed below:

**ANCHORAGE**  
3301 Eagle Street  
Box 107019  
Anchorage, AK 99510-7019  
(907) 264-2424

**FAIRBANKS**  
675 Seventh Avenue  
Station "J"  
Fairbanks, AK 99701-4593  
(907) 451-2889

**JUNEAU**  
1111 West 8th Street  
Box 21149  
Juneau, AK 99802-1149  
(907) 465-2790

**NOTICE TO EMPLOYER:** AS 23.30.060 requires that you post this notice in three conspicuous places on the employer's premises.

**ORDER FOR MEDICAL TREATMENT**

FILE NUMBER

TO:

DR.

ADDRESS

FROM: (EMPLOYER)

LOCATION

PLEASE RENDER TREATMENT TO:

EMPLOYEE

ADDRESS

EMPLOYEE NO.

HOME PHONE

DATE OF INJURY

HOUR

NATURE OF INJURY

HOW INJURED

ISSUED BY

DATE OF ORDER

TIME

J. Bb Ptd. in U.S.A.

**FOR DOCTOR****DOCTORS' FINDINGS AND DISPOSITION**

PATIENT (NAME OF EMPLOYEE)

HAS BEEN TREATED FOR (INJURY OR ILLNESS)

AND IS:

☐ ABLE TO RESUME HIS REGULAR DUTIES.☐ UNABLE TO RETURN TO WORK.☐ DISABLED FOR APPROXIMATELY \_\_\_\_\_ DAYS.  
(DATE) →☐ TO RETURN FOR RE-TREATMENT ON \_\_\_\_\_  
(HOSPITAL)☐ HOSPITALIZED \_\_\_\_\_

BY \_\_\_\_\_ M.D.

DATE \_\_\_\_\_

☐ OCCUPATIONAL☐ NON-OCCUPATIONAL

REMARKS

**RETURN TO EMPLOYER**

REPORT OF OCCUPATIONAL  
INJURY OR ILLNESS

AWCB Case Number

DO NOT  
WRITE  
IN THIS  
COLUMN

EMPLOYEE'S NOTICE TO EMPLOYER

PLEASE ANSWER ALL QUESTIONS

1. Name (Last, First, Middle Initial)		2. Telephone	3. Date of Birth / /	4. Sex <input type="checkbox"/> M <input type="checkbox"/> F	5. Soc. Sec. Number	FIPS Code
6. Street and Number (Permanent Address)		7. Street and Number (Current Mailing Address if Different)				Occupation
City	State	Zip Code	City	State	Zip Code	Nature of Injury
8. Place of Injury or Exposure (City, Town, Village)		9. Date & Hour of Injury or Exposure to Disease Date / / Hour <input type="checkbox"/> AM <input type="checkbox"/> PM			10. On Employer's Premises? <input type="checkbox"/> Yes <input type="checkbox"/> No	Part of Body
11. Full Name and Address of Attending Physician		12. Hospitalized as In-Patient? <input type="checkbox"/> Yes <input type="checkbox"/> No	13. Name and Address of Hospital			Source
City	State	Zip Code	City	State	Zip Code	Type
14. Nature of Injury or Diagnosis and Part of Body Affected <input type="checkbox"/> Left <input type="checkbox"/> Right		15. Describe How the Injury or Illness Occurred (What Happened)				Length of Service
						Weekly Wage
						Extent
				16. Employee's Signature (If not Available, Explain)	17. Date Signed / /	Ins.

EMPLOYER'S NOTICE OF INJURY

PLEASE ANSWER ALL QUESTIONS

18. Employer's Name		19. Mailing Address (Street and Number)			
20. Alaska Address (If Different from Mailing)		City	State	Zip Code	Telephone
21. Name of Insurer CIGNA Property and Casualty Companies		22. Full Name and Address of Adjusting Company CIGNA			
23. Date Employer First Knew Injury Is Work-Related / /	24. Time Employee Left Work Date / / Hour <input type="checkbox"/> AM <input type="checkbox"/> PM		Mailing Address (Street and Number) P.O. Box 911		
25. Will Injury Result in Lost Time Beyond Date of Accident? <input type="checkbox"/> Yes <input type="checkbox"/> No	26. Date Returned to Work / /	27. Fatality (Death) <input type="checkbox"/> No <input type="checkbox"/> Yes Date / /	City Portland	State OR	Zip Code 97207 Telephone 800-992-7578
28. Place Where Injury or Exposure Occurred if Different from Employer's Mailing Address		29. Employee's Occupation		30. Department in Which Employee Regularly Employed	
31. Date Hired with Present Employer / /	32. Wage (Incl. Board, Room, Gratuities) \$ <input type="checkbox"/> Hr. <input type="checkbox"/> Day <input type="checkbox"/> Wk. <input type="checkbox"/> Mo.		33. Days Employee Works Per Week <input type="checkbox"/> 3 or Less <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7		34. Name Scheduled Days Off
35. Workday Began <input type="checkbox"/> AM <input type="checkbox"/> PM					
36. Was Employee Paid for Day of Injury? <input type="checkbox"/> Yes <input type="checkbox"/> No	37. Alaska Unemployment Insurance Account Number (U.I. Acct. No.)		38. How Did the Accident Occur? (Give Details)		
39. What Was the Employee Doing When the Injury or Illness Occurred? (Be Specific)					
40. Was Accident Caused by Failure of a Machine or Product? <input type="checkbox"/> Yes <input type="checkbox"/> No		41. Were Mechanical Guards or Other Safeguards Provided? <input type="checkbox"/> Yes <input type="checkbox"/> No		42. Name Machine, Substance or Object Which Directly Injured Employee	
43. If Mechanical, Specifically What Part?					
44. Names and Addresses of Witnesses		45. If the Accident Was Caused by Anyone Besides Employee, Give Name and Address			
46. Dependents (Name and Address in Case of Death)					
47. If You Doubt Validity of Claim, State Reason					
48. Signature of Authorized Employer Representative		49. Title		50. Date Signed / /	

**To the Employee:**

Obtain first aid or medical treatment immediately. Ask your doctor to file a "Physician's Report" (Form No. 07-6102).

Notify your employer and complete the "Employee's Notice to Employer" section of this form (No. 07-6101), "Report of Occupational Injury or illness."

If your injury causes disability longer than three calendar days, read and follow the instructions on the front of the green copy of this form. The insurer uses this information to compute your weekly compensation rate.

If you, your employer, and your doctor have promptly filed reports there should be no delay in payment of compensation to you. The first installment of compensation becomes due on the 14th day after the employer has knowledge of the injury, death, illness or disease. After the first payment you should continue to receive a check every two weeks during the time you are totally disabled. If you have not received payment within 21 days from the date you were injured, contact the Workers' Compensation Division of the Alaska Department of Labor nearest you. You will not be paid for the first three days unless your disability lasts for more than 28 days.

**Alaska Workers' Compensation Division Offices:**

**ANCHORAGE:** 3301 Eagle Street, Suite 302  
(Location)  
Pouch 7-019 (Mailing)  
Anchorage, Alaska 99510  
PHONE: (907) 264-2424

**FAIRBANKS:** 675 Seventh Avenue, Station J  
Fairbanks, Alaska 99701  
PHONE: (907) 452-1509

**JUNEAU:** 1111 West 8th Street  
(Location)  
P.O. Box 1149 (Mailing)  
Juneau, Alaska 99802  
PHONE: (907) 465-2790

**Division of Labor Standards and Safety Offices:**

**ANCHORAGE:** 3301 Eagle Street, Suite 303  
(Location)  
Pouch 7-022 (Mailing)  
Anchorage, Alaska 99510  
PHONE (907) 264-2597

**JUNEAU:** 1111 West 8th Street  
(Location)  
P.O. Box 1149 (Mailing)  
Juneau, Alaska 99802  
PHONE: (907) 465-4856

**To the Employer:**

This form (07-6101) must be completed and mailed immediately and in no case later than ten days after you have knowledge that one of your employees has been, or claims to have been injured while in your employ.

"Injury" means accidental injury or death arising out of and in the course of employment and an occupational disease, illness or infection which arises naturally out of the employment or which naturally or unavoidably results from an accidental injury

Failure to file an Employer's Report within the required time may subject you and/or your insurer to the payment of a penalty equal to 20% of the amount of compensation payable to the injured employee and interest.

Reports should be mailed to:

Blue Copy .....	Alaska Workers' Compensation Board P.O. Box 1149, Juneau, Alaska 99802
White Copy .....	Your Adjusting Company
Pink Copy .....	Employer's File
Yellow and Green Copies .....	Employee

OSHA Form 101:

Reporting Industrial Fatalities and Accidents to the Division of Labor Standards and Safety.

Alaska Statute Section 18.60.058 requires employers to report to the Division of Labor Standards and Safety an employment accident which is fatal to one or more employees or which results in the overnight hospitalization of one or more employees. The report, which must be made immediately but no later than 24 hours after receipt by the employer of information that the accident has occurred must relate the circumstance of the accident, the number of fatalities and the extent of any injuries